R440LX
Server Motherboard
Product Guide

Order Number: 687492-002

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This equipment has been tested and verified to Class B limits when in a compatible host computer, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

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1 Motherboard Description

Introduction

The R440LX motherboard provides an entry-level path to server/client performance based on the Pentium® II processor. The motherboard is designed to let you upgrade the processor, add RAM, add boards (four PCI, one ISA), and has standard AT† form factor.

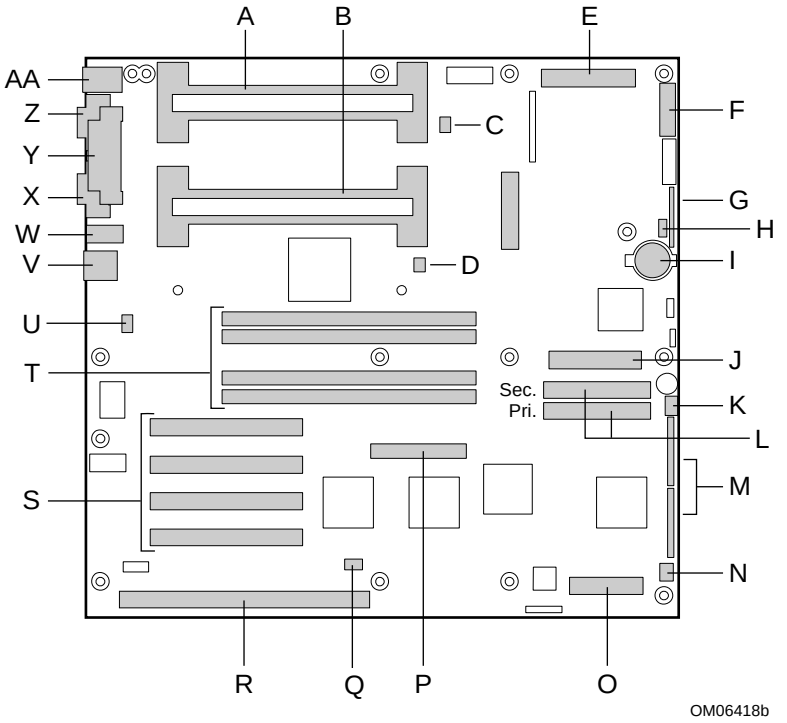
Motherboard Features

Feature	Description
Processor	Up to two Pentium II processors, packaged in single edge contact (S.E.C.) cartridges and installed in 242-pin Slot 1 processor connectors, operating at 1.8 V to 3.5 V. The motherboard's voltage regulator is automatically programmed by the processor's VID pins to provide the required voltage.
Memory, dynamic random access (DRAM)	Four 72-bit sockets (a total of 32 to 512 MB can be installed) for SDRAM dual inline memory modules (DIMM)
Video memory (DRAM)	Installed: 1 MB of 60 ns video memory
Read-only memory (ROM)	512 KB of flash read-only memory to store BIOS and other information that must be in nonvolatile memory
PCI bus	Four PCI expansion slots for add-in boards. 1x32 bit PCI bus. Embedded devices: video controller, Network Interface Controller (NIC), and SCSI controller
ISA bus	One ISA expansion slot for add-in boards. Embedded PC-compatible support (serial, parallel, mouse, keyboard, diskette, and Plug and Play features)
Server Management	Thermal/voltage monitoring and error handling Real-time clock/calendar (RTC) Front panel controls and indicators (LEDs) System Configuration Utility (SCU) Basic Input/Output System (BIOS), POST, and Setup stored in flash memory

Continued

Feature	Description
Graphics	Integrated onboard Cirrus Logic CL-GD5446 super video graphics array (SVGA) controller; 1 MB video memory
SCSI	Adaptec† AIC-7880 Wide, Fast-20, PCI 2.1-compliant SCSI controller
Network	Integrated onboard NIC, an Intel 82557 PCI LAN controller for 10 or 100 Mbps TX Fast Ethernet† networks. RJ-45 Ethernet connector and indicator LEDs at I/O back panel.

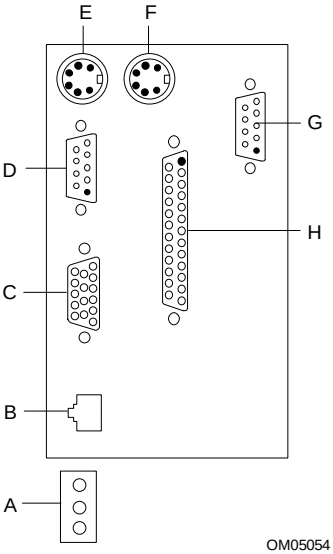
Motherboard Connector and Component Locations



A Slot 1 secondary connector
B Slot 1 primary connector
C Fan heat sink secondary connector
D Fan heat sink primary connector
E Main power connector (from power supply), 24 pin
F Front panel connector, 16 pin
G AT front panel connector

H Local IMB connector
I Lithium backup battery
J Diskette drive connector
K System fan 1 connector
L IDE connectors, primary (labeled IDE1) and secondary (labeled IDE2)
M Configuration jumper blocks
N System fan 2 connector
O Server monitor mechanism (SMM) connector
P Wide SCSI connector
Q Hard drive LED connector
R ISA slot for add-in board (one)
S PCI slots for add-in boards (four); slot 1 is closest to ISA slot
T Memory sockets for four DIMM components; socket 4 is closest to PCI slots
U Chassis intrusion switch connector
V RJ-45 network controller*
W Serial port B (COM 2)*
X VGA† monitor port*
Y Parallel port*
Z Serial A (COM 1)*
AA Keyboard and Mouse PS/2† compatible connectors (interchangeable)*
* See “Back Panel Connectors,” below.

Back Panel Connectors



A Network controller LEDs
  Activity (top)
  Link (middle)
  Speed (bottom)
B RJ-45 network connector port
C VGA, 15-pin video connector
D Serial port A, 9-pin connector (COM1)
E PS/2-compatible keyboard port, 6-pin miniature Deutsche Industrie Norm (DIN) connector (interchangeable with mouse port)
F PS/2-compatible mouse port, 6-pin DIN connector (interchangeable with keyboard port)
G Serial port B, 9-pin connector (COM2)
H Parallel port (LPT1), 25-pin connector

Microprocessor

Processors are not included with the R440LX motherboard and must be purchased separately. The motherboard supports up to two Intel Pentium II processors. Each processor is packaged in a Single Edge Contact (S.E.C.) cartridge. The cartridge includes the processor core operating at 233, 266, or 300 MHz with an integrated 32 KB (16 KB data, 16 KB instruction) primary (L1) cache; the secondary (L2) cache; a thermal plate; and a back cover. The 300 MHz processor with Error Correcting Code (ECC) on the L2 cache is recommended for dual processing applications. If you are installing two processors, make sure they have:

- Identical speeds and second-level cache sizes. The speed and cache size are printed on the top edge of the processor.
- Identical steppings of not more than one stepping apart. The stepping is designated by a 5-letter code, i.e., SL28R, printed on the top edge of the processor.

The S.E.C. cartridges are mounted in a dual-processor retention mechanism, which is provided with the R440LX motherboard. When you buy a boxed processor to install on the motherboard, it comes with parts that are not necessary for installation. The retention mechanism is keyed to ensure correct orientation and is mounted with four screws, which are also provided.

Pentium II processors implement the MMX™ technology and maintain full backward compatibility with the 8086, 80286, Intel386™, Intel486™, Pentium, and Pentium Pro processors. The processor's numeric coprocessor significantly increases the speed of floating-point operations and complies with ANSI/IEEE standard 754-1985.

The processor external interface (GTL+ Pentium II processor bus) is MP-ready and operates at 66 MHz. The processor contains a local APIC section for interrupt handling in MP and UP environments.

The L2 cache is located on the substrate of the S.E.C. cartridge. The cache includes burst pipelined synchronous static RAM (BSRAM). The L2 cache is offered in 512 KB configurations only, with ECC that operates at half the core clock rate.

CAUTION, single-processor configurations

If you install only one processor in a system, it must go in the Slot 1 primary connector (closest to the DIMM sockets and the center of the motherboard). In a single-processor configuration, you must install a termination board in the empty Slot 1 secondary connector (closest to the edge of the motherboard) to ensure proper operation of your system. A termination board is provided with the R440LX motherboard. See Chapter 3, "Integrating and Upgrading Hardware."

CAUTION, do not overtighten screws

The four screws used to attach the retention mechanism to the motherboard should not be tightened to more than six inch-pounds of torque. See Chapter 3, "Integrating and Upgrading Hardware."

Memory

Only SDRAM is supported by the motherboard. Memory is partitioned as four banks of SDRAM DIMMs, each providing 72 bits of noninterleaved memory (64-bit main memory plus ECC):

- Install from 32 MB to 512MB of memory, using up to four single- or double-banked DIMMs.

Installed DIMMs must be the same speed.

Dual address strobe (RAS) signals are provided for each DIMM. When single-banked DIMMs are used, one of the RAS lines is connected to both 36-bit "halves" of the DIMM. When double-banked DIMMs are used (known as Dual RAS), both RAS lines are connected to two 36-bit "quarters" of the DIMM.

Some operating systems and application programs use base memory—for example, MS-DOS†, OS/2†, and UNIX†. Other operating systems use both conventional and extended memory—for example, OS/2 and UNIX. MS-DOS does not use extended memory; however, some MS-DOS utility programs such as RAM disks, disk caches, print spoolers, and windowing environments use extended memory for better performance.

The controller automatically detects, sizes, and initializes the memory array, depending on the type, size, and speed of the installed DIMMs, and reports memory size and allocation to the system via configuration registers.

DIMM sizes and compatibility

We do not test every possible combination of DIMM sizes and vendors. To avoid potential memory problems, use DIMMs that have been tested for compatibility with the motherboard. The table below lists some sample size combinations. Contact your sales representative or dealer for more information about your system.

Sample DIMM Component Combinations

Bank 0 (slot J1)	Bank 1 (slot J2)	Bank 2 (slot J3)	Bank 3 (slot J4)	Total memory
32				32 MB
32	32			64 MB
32	32	128		192 MB
32	32	128	128	320 MB
32	128	128	128	416 MB
128	128	128	128	512 MB

Peripherals

Super I/O Chip: Compatibility I/O Controller

The National Semiconductor PC87307VUL Super I/O chip (87307) supports two serial ports, one parallel port, diskette drive, PS/2-compatible keyboard and mouse, and integrated RTC. The motherboard provides the connector interface for each port.

Serial Ports

Both serial ports are relocatable. By default, port A appears at the onboard DB9 connector, port B on the 10-pin header. Each serial port can be set to one of four different COMx ports and can be enabled separately. When enabled, each port can be programmed to generate edge- or level-sensitive interrupts. When disabled, serial port interrupts are available to add-in boards.

Parallel Port

The 87307 provides one IEEE 1284-compatible 25-pin bidirectional EPP (supporting levels 1.7 and 1.9). BIOS programming of the 87307 registers enable the parallel port and determine the port address and interrupt. When disabled, the interrupt is available to add-in boards.

Diskette Port

The floppy disk controller (FDC) on the 87307 is functionally compatible with 82077SL, 82077AA, and 8272A diskette drive controllers. The motherboard provides the 24 MHz clock, termination resistor package, and chip selects. All other FDC functions are integrated into the 87307, including PLL separator and 16-byte first-in, first-out (FIFO).

Add-in Board Slots

The motherboard has one full-length dedicated ISA bus slot, which can have a bus master in it. ISA features:

- Bus speed up to 8.33 MHz
- 16-bit memory addressing
- Type A transfers at 5.33 Mbps
- Type B transfers at 8 Mbps
- 8- or 16-bit data transfers
- Plug and Play ready

The motherboard also has four dedicated full-length PCI slots. PCI features:

- Bus speed up to 33 MHz
- 32-bit memory addressing
- 5 V signaling environment
- Burst transfers of up to 133 Mbps
- 8-, 16-, or 32-bit data transfers
- Plug and Play ready
- Parity enabled

Video

The onboard, integrated Cirrus Logic CL-GD5446 32-bit VGA contains a clock generator, an 80 MHz RAMD AC in a 208-pin plastic quad flat pack (PQFP), and an SVGA controller that is fully compatible with these video standards: CGA†, EGA†, Hercules† Graphics, MDA†, and VGA. Standard video memory consists of two 256 K x 16 DRAM chips providing 1 MB of 60 ns video memory. The 5446 supports a variety of modes: up to 1280 x 1024 resolution, and up to 64 K colors.

This SVGA subsystem supports analog VGA monitors, single and multi-frequency, interlaced and non-interlaced, up to 87 Hz vertical retrace frequency. The connector is a standard 15 pin VGA connector.

The SVGA controller supports analog VGA monitors (single and multiple frequency, interlaced and noninterlaced) with a maximum vertical retrace interlaced frequency of 87 Hz.

You cannot add memory to this motherboard. Depending on the environment, the controller displays up to 64 K colors in some video resolutions. It also provides hardware-accelerated bit block transfers (BITBLT) of data.

SCSI Controller

The motherboard includes an Adaptec AIC-7880 wide/fast-20, SCSI III compatible controller chip that is integrated as a PCI bus master. The adapter supports 8- or 16-bit Fast SCSI that provides 10 or 20 MB/sec throughput, or Fast-20 Wide SCSI that can burst data at 20 or 40 MB/sec.

No logic, termination, or resistor loads are required to connect devices to the SCSI controller other than termination in the device at the end of the cable. The SCSI bus is terminated on the motherboard with active terminators that cannot be disabled. The onboard device must always be at one end of the bus.

IDE Controller

IDE is a 16-bit interface for intelligent disk drives with AT disk controller electronics onboard. The PCI/ISA/IDE Accelerator, also known as PIIX4, is a multifunction device on the motherboard that acts as a PCI-based Fast IDE controller. The device controls:

- PIO and IDE DMA/bus master operations
- Mode 4 timings
- Transfer rates up to 22 MB/sec
- Buffering for PCI/IDE burst transfers
- Master/slave IDE mode
- Up to two drives per channel; two channels, IDE0 and IDE1

18-inch maximum length of IDE cable on each channel
You can connect an IDE signal cable, up to a maximum of 18 inches each, to each IDE connector on the motherboard. Each cable can support two devices, one at the end of the cable and one 6 inches from the end of the cable.

Network Controller

The motherboard includes an integrated NIC, which is the Intel 82557 PCI LAN Controller for 10 or 100 Mbps TX Fast Ethernet networks. The network ID is stored in an EEPROM on the motherboard. As a PCI bus master, the controller can burst data at up to 133 MB/sec. The controller contains two receive and transmit FIFO buffers that prevent data overruns or underruns while waiting for access to the PCI bus. The controller has the following:

- 32-bit PCI bus master interface (direct drive of bus), compatible with *PCI Bus Specification, Revision 2.1*
- Chained memory structure with improved dynamic transmit chaining for enhanced performance
- Programmable transmit threshold for improved bus utilization
- Early receive interrupt for concurrent processing of receive data
- On-chip counters for network management
- Autodetect and autoswitching for 10 or 100 Mbps network speeds
- Support for both 10 Mbps and 100 Mbps networks, capable of full or half duplex, with back-to-back transmit at 100 Mbps

The network status LEDs on the motherboard indicate:

- Transmit/receive activity on the LAN
- Valid link to the LAN
- 10/100 Mbps transfer mode

Keyboard and Mouse

The keyboard / mouse controller is PS / 2-compatible. The system may be locked automatically if there is no keyboard or mouse activity for a predefined length of time, if specified through the SCU. Once the inactivity (lockout) timer has expired, the keyboard or mouse does not respond until the previously stored password is entered.

Server Management

Server Management features are implemented using three microcontrollers and one PLD:

- Motherboard Management Controller (BMC)
- Front Panel Controller (FPC)
- Processor Board Controller (PBC)
- Distributed Integrated Server Management Interface Controller (DISMIC)

BMC—The BMC is an 8051-compatible microcontroller located on the motherboard. The BMC monitors motherboard power supply and SCSI termination voltages using an external Analog to Digital Converter (ADC); the BMC checks the status of the fan failure indicators. The BMC also monitors system temperature sensors on the intelligent management bus. When any monitored parameter is outside defined thresholds, the BMC generates a system management interrupt (SMI). The BMC also provides general-purpose I / O (GPIO) functions and acts as the primary communications gateway to the FPC, PBC, and DISMIC by providing support routines for IMB and ISA communications

An EEPROM associated with the secondary motherboard temperature sensor contains the values for the chassis ID, motherboard ID, power state, and motherboard temperature during power-off conditions. The BMC manages these values via IMB.

FPC—The FPC, located on the motherboard, manages system power on / off control, system reset, and front panel NMI buttons, along with an external IMB interface. The +5V standby power supply powers the device so that it retains power even when system power is off. The FPC controls main power to the motherboard and is responsible for monitoring all sources of power control both on and off the motherboard, including the Front Panel, Server Monitor Mechanism, PIIX4, and RTC power control signals. The FPC also detects chassis intrusion by monitoring an external switch and remembers the last power state if AC power is unterrupted.

PBC—The PBC monitors processor voltage levels, processor thermal trip and internal error signals, and provides the interface to the board ID information. The PBC can be polled for current status or configured to automatically send an alert message when an error condition is detected.

The PBC implements Fault Resilient Booting (FRB) levels 1, 2, and 3. If two processors are installed and the processor designated as the bootstrap processor fails to complete the boot process, FRB attempts to boot the system using the alternate processor.

- FRB level 1 is for recovery from a BIST failure detected during POST. This FRB recovery is fully handled by BIOS code.
- FRB level 2 is for recovery from a Watchdog timeout during POST. The Watchdog timer for FRB level 2 detection is implemented in the PBC.
- FRB level 3 is for recovery from a Watchdog timeout on hard reset / power up. Hardware functionality for this level of FRB is managed by the PBC on the processor subsystem.

DISMIC—The two microcontrollers on the motherboard communicate using the IMB bus. The BMC and DISMIC manage communication between this distributed controller network, SMI handler, and Systems Management Software (SMS) running on the server. The DISMIC functions as a bridge between the BMC and ISA bus.

System Security

The Setup program enables you to set both an administrative and a user password. To set a password, see Chapter 2.

□ □ □

2 Configuring the System

This chapter describes the system configuration utilities. The table below briefly describes the utilities.

Utility	Description and brief procedure	Page	How provided
System Configuration Utility (SCU)	To use the SCU, the system must have a working, enabled diskette drive, and you must have a copy of the SCU on a DOS-bootable diskette (copied from the Configuration Software CD): • To enable and configure a diskette drive, use BIOS Setup first. Then use the SCU. Information entered via the SCU overrides information entered via Setup. • To copy the SCU from the source CD onto diskette, see “Boot from CD and Copy Configuration Software to Diskettes” on page 28.	25	On the Configuration Software CD shipped with the system
BIOS Setup	If the system does not have a diskette drive, or the drive is disabled or misconfigured, use Setup to enable it. Or, you can move the CMOS jumper on the motherboard from the default setting (Protect CMOS memory) to the Clear setting; this will allow most system configurations to boot. For the procedure to do this, see the section “CMOS Jumper” in Chapter 4 in this manual. Then run the SCU to configure the system.	48	Stored in flash memory and in battery-backed memory on the motherboard

Continued

Utility	Description and brief procedure	Page	How provided
SCSI*Select*† Utility	Use to configure or view the settings of the AIC-7880 *Ultra*SCSI host adapters and onboard SCSI devices in the system.	70	Enabled in Setup (option on Advanced Chipset Configuration menu). Supplied with system BIOS
Configuring the Network Interface Controller (NIC)	Use to configure the PCI LAN Bus Controller on the motherboard.	79	Supplied on CD with the system

Using the SCU

The SCU is the main tool to configure the system or to check or change the configuration. Many system settings can be entered from either the SCU or Setup, but the SCU provides conflict resolution as well as access to information about ISA, ISA Plug and Play, and PCI adapters. The SCU is PCI-aware, and it complies with the ISA Plug and Play specifications. The SCU works with any compliant configuration (.CFG) or overlay (.OVL) files supplied by a peripheral device manufacturer.

System must have a diskette drive
The system must have a diskette drive present and enabled to use the SCU. If a diskette drive is present but is disabled or misconfigured, use the BIOS Setup utility to enable or configure the drive.

Where the SCU Gets Information

Source	Description
Configuration (.CFG) and overlay (.OVL) files	For the motherboard, we provide a .CFG file and an .OVL file with the SCU. These files describe the board's characteristics and the system resources required. Some ISA adapters come with a diskette that contains a .CFG file (and an optional .OVL file).
Configuration registers	Information and required resources for PCI and Plug and Play adapters are derived from the adapter's configuration registers.
User selected options	The SCU displays the exact system configuration and the user's current settings by reading ISA CMOS and system nonvolatile storage (NVRAM or flash memory).

Using information from the sources listed above, the SCU stores the system configuration in ISA CMOS and system nonvolatile storage (NVRAM or flash memory).

At power-on or rebooting, the BIOS POST routines and the Plug and Play Auto Configuration Manager check and configure the hardware. If possible, POST will program the hardware according to the configuration stored by the SCU; if conflicts exist, an error message will be generated. You must then use the SCU to correct the conflict before the system boots.

When to Run the SCU

- When you first set up and configure an R440LX-based system
- If you get a configuration error message at power-on
- Whenever you add, remove, or move an ISA adapter that is not Plug and Play
- Whenever you add or remove memory
- In general, whenever you add hardware to or remove hardware from an R440LX-based system

Running the SCU is also recommended but optional for Plug and Play and PCI adapters.

Record Your SCU Settings

Record your SCU settings. If the default values ever need to be restored (after a CMOS-clear, for example), you must run the SCU to reconfigure your system. Your task will be easier if you record SCU settings beforehand.

How to Enter and Start the SCU

Copy SCU to diskette
Before you can run the SCU from a diskette, you must copy the SCU from the Configuration Software CD to a diskette. To create this diskette, see "Boot from CD and Copy Configuration Software to Diskettes" on page 28.

1. Turn on your video display monitor and system.
2. You can enter and start the SCU in three different ways. Whether or not you can use the second and third ways described in the following table depends on how much main memory is used by drivers loaded on the system.

⟹ **Use diskette**
Always start with a diskette that contains the SCU you copied from the Configuration Software CD.

You can start the SCU from these sources:	How to do it:
From diskette at boot time	Insert your SCU diskette in drive A. Press the reset button or type <Ctrl+Alt+Del> to reboot the system.
From diskette after installing your operating system	Insert your SCU diskette in drive A. At the DOS prompt, type **a:** and press <Enter> to change to drive A. Type **AUTOEXEC** and press <Enter> to start the SCU.
From a hard drive after installing your operating system	Insert your SCU diskette in drive A and copy the contents to a directory on your hard drive. Change to that directory, and type **AUTOEXEC** and press <Enter>.

A message like this message appears:

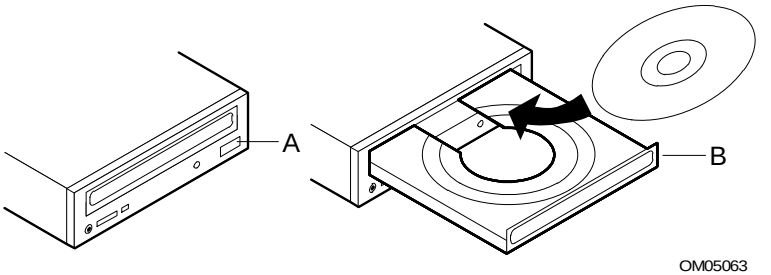
```
MS DOS startup menu

------------------------------

1.  Execute SCU

2.  Execute SCU for system with PNP OS
```

3. If your operating system is not Plug and Play aware, type 1.

   If your operating system is Plug and Play aware, type 2. The Plug and Play-aware OS then manages the resources of all PCI and Plug and Play devices in the system.

4. When the SCU title appears on the screen, press any key to continue.
5. From the main menu, press <↑> or <↓> to highlight an item and then press <Enter> to select it. If you are using a mouse, point to an item and single-click the left button to select it. Press <F1> at any time for help about a selection.
6. From the main menu, select "Step 1: About System Configuration" for information about setting up the system.

Boot from CD and Copy Configuration Software to Diskettes



Typical CD-ROM drive

A Open/close push-button switch

B CD tray, CD with label side up

CAUTION, handle CD only by the edges
Handle the CD only by its inner and outer edges. Do not touch the side **without** the label (the data side).

1. Open the CD tray.
2. Open the CD case. Press down on the center hub of the case to release the CD.
3. Gently grasp the center hole and outer edge of the CD. Remove it from the case, and place it **label-side up** in the CD tray.
4. Close the CD tray.
5. Restart the server.
6. When POST completes, the server boots from the CD and displays the CD-ROM menu bar. Browse to see the tasks available (create diskettes, diagnostics, read and print manuals, quit to DOS). If the following message appears,

   `Insert bootable media in the appropriate drive`

   you may need to change the BIOS setup to boot from CD. See “Boot Menu” on page 68. Set the first boot device to CD-ROM, the second to diskette, and the third to hard disk.
7. Select the option Create Diskettes. Make sure you have several diskettes on hand.
8. Follow the prompts to copy the SCU software from CD onto diskettes. You must have the SCU on diskette when you start to configure the server.

9. Repeat the process to copy other menu choices onto diskettes.
10. After creating diskettes, quit to DOS.
11. When finished, remove the CD from the server.

When you copy software from CD onto diskettes, device drivers suitable for several different operating systems are copied onto the diskettes. However, your operating system will read only those drivers it can recognize, so you cannot usually check the directory of a diskette that is not formatted for your operating system (instead, you may get a message to the effect, "disk not formatted, do you want to format it now?"). Don't worry; the drivers for YOUR operating system should be present on the diskette and available for you to load on your system.

Other Tasks You Can Do from the CD Menu

- Copy diagnostic programs onto diskette to run from diskette
- Create diskettes (copy drivers from CD to diskette)
- Read and Print Manuals
- Quit to DOS

Scroll to select the task you want. Follow the prompts to complete the task.

Regarding the **diagnostic programs,** a diagnostics package for the system is contained in the DISK 1 image on the CD. For documentation about the test modules, see the two PCDiagnostic help files that end with the extension .HLP. They are ASCII files that you can print to create a manual about the tests in the diagnostic package. While running the tests, you can access help by pressing the <F1> key. You will be prompted to insert the help disks into the diskette drive, and the help information for the desired test will be displayed.

Access the *R440LX Server Motherboard Product Guide*

The Configuration Software CD contains files for the *Product Guide*, which is this motherboard manual. If you are reading this page, you have already been able to boot from the CD and read or print the manual files (Adobe† Acrobat† .PDF files or PostScript† .PS files.

Six Steps in Using the SCU

The SCU main menu lists six steps to configure your system.

SCU Step	Description
System Configuration Utility **Step 1: About System Configuration** Step 2: Add and Remove Boards Step 3: Change Configuration Settings Step 4: Save Configuration Step 5: View Switch/Jumper Settings Step 6: Exit	Displays a brief text overview of the SCU and some important terms and definitions.
System Configuration Utility Step 1: About System Configuration **Step 2: Add and Remove Boards** Step 3: Change Configuration Settings Step 4: Save Configuration Step 5: View Switch/Jumper Settings Step 6: Exit	Displays a menu that lists all installed boards and devices. Most ISA boards cannot be detected automatically by the SCU, so you MUST use this step to add them to the system. PCI and ISA Plug and Play boards are automatically detected and added by the SCU. ⇒ **Note:** Manually verify the resource settings of any adapters before saving your configuration.
System Configuration Utility Step 1: About System Configuration Step 2: Add and Remove Boards **Step 3: Change Configuration Settings** Step 4: Save Configuration Step 5: View Switch/Jumper Settings Step 6: Exit	Use to view or change the configuration settings for a board installed in the system. Verify that the motherboard and adapter board resources are set properly. If you make changes, you can save them and exit this menu or exit without saving changes. Follow the onscreen prompts. ⇒ **Note:** For details about the menus and options in this step, see the section that begins on page 38.

Continued

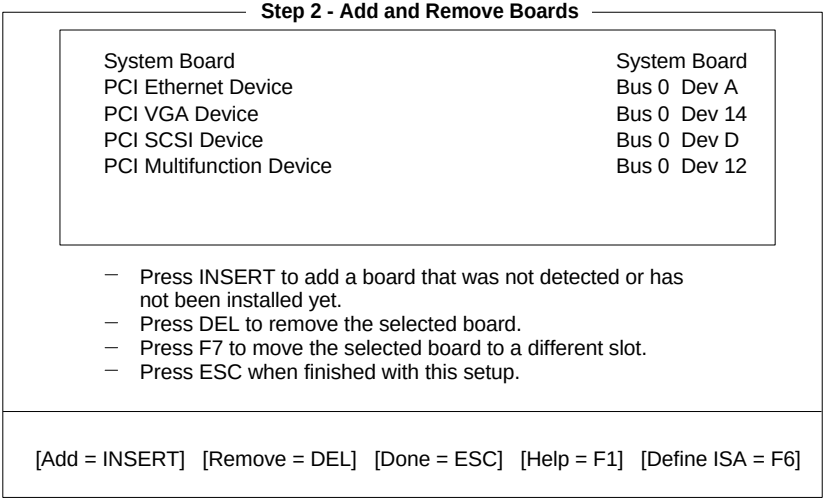
SCU Step	Description
System Configuration Utility Step 1: About System Configuration Step 2: Add and Remove Boards Step 3: Change Configuration Settings **Step 4: Save Configuration** Step 5: View Switch/Jumper Settings Step 6: Exit	⇒ **Note:** BEFORE selecting step 4, make sure you are ready to save the settings. The process begins immediately once you select this step and is completed when you see a check mark beside the step number. Saves configuration settings to nonvolatile RAM as well as to a backup file (.CMS file). You must save your settings once they have been configured.
System Configuration Utility Step 1: About System Configuration Step 2: Add and Remove Boards Step 3: Change Configuration Settings Step 4: Save Configuration **Step 5: View Switch/Jumper Settings** Step 6: Exit	View manufacturer's instructions about setting dip switches and jumpers, and run utilities to ensure the correct configuration of each adapter.
System Configuration Utility Step 1: About System Configuration Step 2: Add and Remove Boards Step 3: Change Configuration Settings Step 4: Save Configuration Step 5: View Switch/Jumper Settings **Step 6: Exit**	Exit to the operating system. If any settings were changed, you will be prompted to restart your system to see the changes.

About System Configuration

This step provides basic information for configuring expansion devices. More experienced users can skip this step.

Add and Remove Boards

Use step 2 to add, delete, or move boards. Most ISA boards cannot be detected automatically by the SCU, so you MUST use this step to add them to the system. However, PCI and ISA Plug and Play boards ARE automatically detected and added by the SCU. If the SCU did not detect a board, you can add a board using this step.


Step 2 - Add and Remove Boards
System Board
PCI Ethernet Device
PCI VGA Device
PCI SCSI Device
PCI Multifunction Device
System Board
Bus 0 Dev A
Bus 0 Dev 14
Bus 0 Dev D
Bus 0 Dev 12
– Press INSERT to add a board that was not detected or has not been installed yet.
– Press DEL to remove the selected board.
– Press F7 to move the selected board to a different slot.
– Press ESC when finished with this setup.
[Add = INSERT] [Remove = DEL] [Done = ESC] [Help = F1] [Define ISA = F6]

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To add a board:

1. Press <Ins>.
2. From the Select the Board to Add dialog box, select the board's .CFG file and press <Enter>.

To delete an existing board:

1. Use the arrow keys to select the board you want to delete.
2. Press <Del>.
3. Confirm that you want to delete the board.

To move a board from one slot to another:

1. Use the arrow keys to select the board you want to move.
2. Press <F7>.

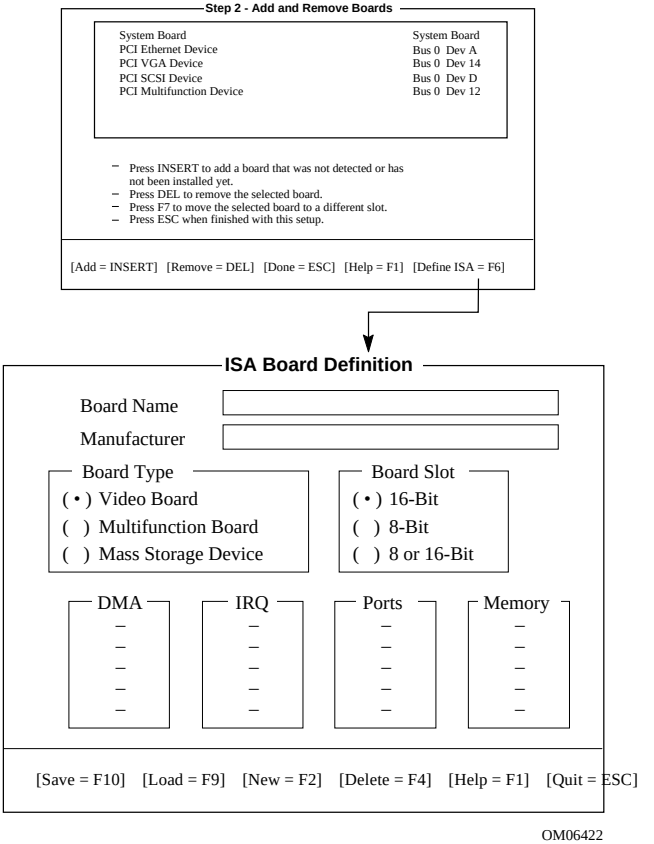
If you add, move, or remove boards
Manually verify the resource settings of these adapters, and any other adapters that are not locked, before saving your configuration.

To define an ISA board:

1. Press <F6> to display the ISA Board Definition dialog box. Refer to the section below for details.

Define an ISA Board

To define an ISA board that has no .CFG file, press <F6> while viewing the Add and Remove Boards screen. The ISA Board Definition dialog box will appear. It is necessary to define a board to prevent other boards in the system from using the same IRQ levels, DMA channels, I/O addresses, or memory addresses as that of the ISA board.


Step 2 - Add and Remove Boards
System Board
PCI Ethernet Device
PCI VGA Device
PCI SCSI Device
PCI Multifunction Device
System Board
Bus 0 Dev A
Bus 0 Dev 14
Bus 0 Dev D
Bus 0 Dev 12
– Press INSERT to add a board that was not detected or has not been installed yet.
– Press DEL to remove the selected board.
– Press F7 to move the selected board to a different slot.
– Press ESC when finished with this setup.
[Add = INSERT] [Remove = DEL] [Done = ESC] [Help = F1] [Define ISA = F6]
ISA Board Definition
Board Name
Manufacturer
Board Type
(•) Video Board
( ) Multifunction Board
( ) Mass Storage Device
Board Slot
(•) 16-Bit
( ) 8-Bit
( ) 8 or 16-Bit
DMA
IRQ
Ports
Memory
[Save = F10] [Load = F9] [New = F2] [Delete = F4] [Help = F1] [Quit = ESC]

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If an ISA board is already installed, you can press <F9> to load its definition and then modify that definition for a new ISA board you are installing.

If no ISA board is installed, do the following steps:

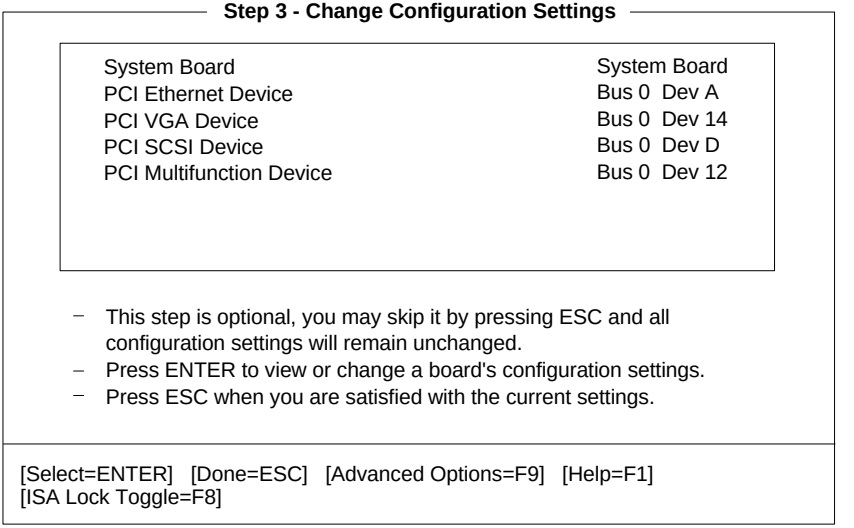
1. In the Board Name box, type a description of the board.
2. In the Manufacturer box, type the name of the board manufacturer.
3. From the Board Type box, choose the type of board.
4. From the Board Slot box, choose the type of slot.
5. In the DMA box, define up to four DMA channels.
6. In the IRQ box, define up to seven IRQ levels.
7. In the Ports box, define up to eight ranges of I/O ports.
8. In the Memory box, define up to eight memory address ranges.
9. Press <F10> to save the ISA board definition.

To load an existing ISA board: Press <F9>.

To delete an ISA board: Press <F9>, and confirm that you intend to delete the ISA definition.

Change Configuration Settings

Use step 3 to view or change the configuration settings for any board in the system. You can verify that the motherboard and adapter board resources are set properly. Configuring the motherboard involves a number of options, so this process and sample screen displays are described in detail, starting on page 38.


Step 3 - Change Configuration Settings
System Board
PCI Ethernet Device
PCI VGA Device
PCI SCSI Device
PCI Multifunction Device
System Board
Bus 0 Dev A
Bus 0 Dev 14
Bus 0 Dev D
Bus 0 Dev 12
– This step is optional, you may skip it by pressing ESC and all configuration settings will remain unchanged.
– Press ENTER to view or change a board's configuration settings.
– Press ESC when you are satisfied with the current settings.
[Select=ENTER] [Done=ESC] [Advanced Options=F9] [Help=F1]
[ISA Lock Toggle=F8]

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To view or change the settings for a board:

1. Use the arrow keys to select the board.
2. Press <Enter>.
3. When you are satisfied with the current settings, press <Esc> to return to the main menu.

Advanced Options

The Advanced Options menu is intended for advanced users. These options are available:

Advanced Options	Select to view this information:
Global resource map	A list of allocated resources (DMA, logical slot, IRQ, ports, and memory)
Board details	Details about individual boards
System details	Information on the add-in board slots: slot number, type, whether bus master or not, NVRAM size

To view the Advanced Options menu: from the Change Configuration Settings dialog box, press <F9>.

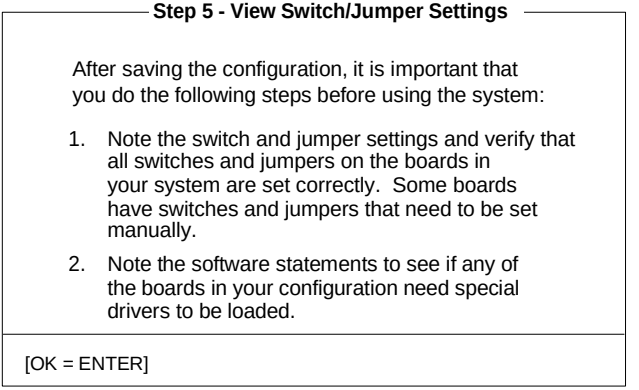
Save Configuration

This step saves the configuration settings to nonvolatile RAM as well as to a backup file (.CMS file). You must save your settings once they have been configured.

View Switch/Jumper Settings

Use this step to view manufacturer's instructions about setting dip switches and jumpers on add-in boards and about running utilities to ensure the correct configuration of each adapter.

This step does not provide switch and jumper information about the motherboard. See Chapter 4 of this manual for defaults and options.


Step 5 - View Switch/Jumper Settings
After saving the configuration, it is important that you do the following steps before using the system:
1. Note the switch and jumper settings and verify that all switches and jumpers on the boards in your system are set correctly. Some boards have switches and jumpers that need to be set manually.
2. Note the software statements to see if any of the boards in your configuration need special drivers to be loaded.
[OK = ENTER]

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Exit

This step exits to the operating system. If any configuration settings were changed, you will be prompted to restart your system to see the changes.

SCU Utilities

At the bottom of the main SCU menu, there is an option to press <F9> to display the Utilities menu. The menu lists options that control how a configuration is produced. For most of these choices, select the option line and press the spacebar to enable / disable the option.

For descriptions of the options, press <F1> for help while the Utilities menu displays on the screen. Here is a little more information about some of the utilities:

Advanced/Dealer Mode—some ISA boards can be shipped with configuration files that contain options that are not ordinarily configured by end users. If this mode is turned on, any functions marked as EXP (expert) in the shipped configuration file will be visible and can be updated.

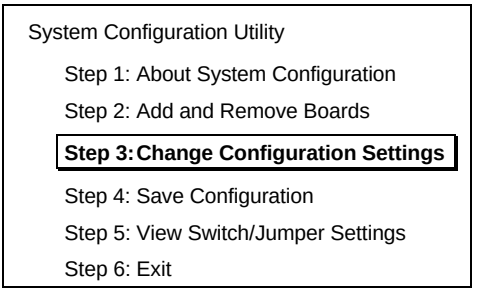
Force new configuration—this option forces the SCU to ignore any information stored in the Extended System Configuration Data (ESCD) structure in NVRAM. This means that any ISA boards will "disappear" and that PCI and Plug and Play ISA settings will be reset.

Specify name for .cms, .inf, and .set files—this option prompts you for the base filename for the .CMS, .INF, and .SET files. This allows you to save configuration information into different filenames. Otherwise, each time a save operation completes in the SCU, the .CMS, .INF, and .SET files will be overwritten. In this system, the default base filename is int31e0, so when the SCU is saved, the files int31e0.cms, int31e0.inf, and int31e0.set are created.

Press <F5> to restore a configuration from a CMS file—a .CMS file is created each time you do a save operation in the SCU. The file contains a copy of the ESCD image as it was stored into nonvolatile memory and can be used to restore this information at a later time. If the configuration information is accidentally erased or a mistake has been made during the configuration process, it might be desirable to restore to a previous configuration. The backup .CMS file provides this mechanism to restore the ESCD image.

Press <F7> to define an ISA board. If you have an ISA board with no .CFG file, you can use the ISA Board Definition screen to define the board. (You can access the same menu from SCU Step 2 by pressing <F6>.)

Configuration Settings for the Motherboard


System Configuration Utility
Step 1: About System Configuration
Step 2: Add and Remove Boards
Step 3: Change Configuration Settings
Step 4: Save Configuration
Step 5: View Switch/Jumper Settings
Step 6: Exit

When you select SCU step 3, Change Configuration Settings, there are many menus and options available under that heading. This section about the SCU shows the screen information that displays **after you select the motherboard from the Change Configuration Settings screen.**

- Default values are in **bold** type.
- Select an option and press <Enter> to display the menu for an option.
- Some items are displayed only, with no selection available here.

Some of the option choices are described below the grouping. Not all of them are described because (A) a few are not user-selectable but are displayed for your information, and (B) many of the option choices are relatively self-explanatory.

Systems Group
System Identification and Version Information

System Identification String	Displays System Identification String
Config and Overlay Version	Displays SCU configuration and overlay version number
BIOS Version String	Displays BIOS version, X.XXX.XXXX.X.XXXXXXXXXX
MP Spec Version	1.1/1.4
System Processor	Displays Pentium II Processor at {XXX} MHz

Memory Subsystem Group

Shadowing ISA ROMs Options	Press <Enter> to modify the shadowing options
Extended Memory Options (Cache, 1MB ISA Hole)	15 MB Extended Memory / 256 KB Cache (WB)

Shadowing ISA ROMs Options—all onboard adapter ROM (stored in compressed form in the system flash ROM) and PCI adapter ROM will be shadowed into RAM in the ISA-compatible ROM adapter memory space between C0000h to DFFFFh. Any BIOS found on ISA devices that can be shadowed will be shadowed into adapter memory space in the same range after initialization. ISA cards that require memory-mapped read / write accessibility should be located into the 15M-16M ISA space, or the 512-640KB space, which may be enabled individually via the SCU. Shadowing for ISA devices can be disabled for various regions via the SCU. A PCI BIOS is always shadowed.

Onboard Disk Controllers

Onboard Floppy Controller	**Enable Primary/Enable Secondary/**Disable
Primary Onboard IDE Controller	**Enable/**Disable

Onboard Communication Devices

Serial Port 1 Configuration	**Port:3F8h IRQ:4 (COM1)** Port:2F8h IRQ:3 (COM2) Port:3E8h IRQ:4 (COM3) Port:2E8h IRQ:3 (COM4) Port 1 Disable
Serial Port 2 Configuration	**Port:2F8h IRQ:3 (COM2)** Port:3F8h IRQ:4 (COM1) Port:3E8h IRQ:4 (COM3) Port:2E8h IRQ:3 (COM4) Port 2 Disable
Serial Port 2 Mode	Serial Port Mode
Parallel Port Configuration	**Port:378h IRQ:7 (LPT1)** Port:278h IRQ:5 (LPT2) Port:3BCh IRQ:7 (LPT3) Parallel Port Disable
Parallel Port Mode	**Parallel Port Mode ISA-Compatible** Parallel Port Mode PS/2 Parallel Port Mode Extended (Not valid with LPT3) Parallel Port Mode ECP on LPT1 with DMA1 Parallel Port Mode ECP on LPT1 with DMA3 Parallel Port Mode ECP on LPT2 with DMA1 Parallel Port Mode ECP on LPT2 with DMA3

Floppy Drive Subsystem Group

Floppy Drive A Options	**3.5 inch 1.44/1.25 MB drive** 5.25 inch 360KB drive 5.25 inch 1.2MB drive 3.5 inch 720KB drive 3.5 inch 2.88 MB drive Disable or Not Installed
Floppy Drive B Options	**Disable or Not Installed** 3.5 inch 1.44/1.25MB drive 5.25 inch 360KB drive 5.25 inch 1.2MB drive 3.5 inch 720KB drive 3.5 inch 2.88MB drive

IDE Subsystem Group	
IDE Configuration - Primary Master	None User **Auto** CD
IDE Drive Options - Primary Master Multisector Transfer	**Disabled**, 2, 4, 8, or 16 Sectors
Translation Mode	**Standard CHS** Logical Block Addressing
IDE Configuration - Primary Slave	None User **Auto** CD
IDE Drive Options - Primary Slave Multisector Transfer	**Disabled**, 2, 4, 8, or 16 Sectors
Translation Mode	**Standard CHS** Logical Block Addressing

Automatic detection and enabling of IDE hard drives—during POST, if an IDE controller is detected, the BIOS does the following:

- Determines the types of IDE drives attached
- Sets the drive parameters for the best performance
- Maps each device into memory and I/O space
- Assigns IRQs and DMA channels so there are no conflicts

If you choose parameters for your drive that are different from the drive's native parameters, your definitions will be programmed into the drive controller.

To disable the IDE controller

If you plan to disable the IDE controller to reuse the interrupt for that controller, you must physically unplug the IDE cable from the board connector (IDE0) if a cable is present. Simply disabling the drive by configuring the SCU option does not make the interrupt available for other use.

Keyboard (KB) and Mouse Subsystem Group	
Typematic Speed	**30 CPS, 26 CPS, 21 CPS, 18 CPS, 13 CPS, 10 CPS, 6 CPS, 2 CPS**
Mouse Control Option	**Mouse Auto detected**

Console Redirection	
Console Redirection Control COM Port for Redirection	**Disable** Port Selection
Serial Port Baud Rate	2400 Baud 9600 Baud 19.2K Baud **115.2K Baud**
Hardware Flow Control	None **CTS/RTS** CTS/RTS & Xoff/Xon
Select Terminal Type	**IBM PC Extended ANSI/VT 100**

Security Subsystems Group

Administrative Password Option	**Disable/**Enabled Press <Enter> to display the Password Menu. After entering a new password, <Tab> down to verify the password. New Password Enter Password XXXXXXX Verify Password XXXXXXX
User Password Option	**Disable/**Enabled Press <Enter> to display the Password Menu. After entering a new password, <Tab> down to verify the password. New Password Enter Password XXXXXXX Verify Password XXXXXXX
Hot Key Option)	**Disable/**{Ctrl-Alt-?} Press <Enter> to display menu: **Disable** Enable <Tab> down to Enable, and then <Tab> to Enter New Hot Key. Type one character, either a letter or number.
Lockout Timer	**Disable** Press <Enter> to display menu of possible choices.
Secure Boot Mode	**Disable/**Enable
Video Blanking	**Disable/**Enable
Floppy Writes	**Enable/**Disable

Security—the BIOS includes security features to prevent unauthorized access to or tampering with the system. Once the security features are enabled, access is allowed only after the correct password has been entered. Enabling is implied if you set a password here.

MultiBoot Group	
Boot Device Priority	Menu for Boot Devices

MultiBoot Group—the sequence that you specify on the menu in the MultiBoot Group will determine the boot order. If secure mode is enabled (a user password is set), then you will be prompted for a password before the system fully boots. If secure mode is enabled and the "Secure Boot Mode" option is also enabled, the system will fully boot but will require a password before accepting any keyboard or mouse input.

SCSI ROM BIOS Options Group	
SCSI-A ROM BIOS Scan	**Enable** Disable (if disabled, the SCSI-A channel is fully configured, but the ROM scan is skipped)

Management Subsystem Group	
System Sensor Control	Press <Enter> to modify the System Sensors.*
System Management Mode	**Enable**/Disable
Event Logging	**Enable**/Disable

* Select and enter values to be used by server management software.

The options in the Management Subsystem Group are used to

- Set up motherboard voltage and temperature scanning by determining the appropriate thresholds
- Enable or disable a system speaker
- Scan the flash memory area for binaries that extend or alter critical event logging

This section does not list the sensors that will be displayed for configuring, because the list depends on information provided by the system at run-time. The information is placed in the system during manufacturing and assembly and depends on the particular configuration of the system.

However, the user interface should be constant when viewed on a sensor-by-sensor basis. The screen gives prompts for how to select and modify values and how to move around the screen. For each available sensor control, the display includes the choices shown below, with blanks for entering values by using the <+> or <-> keys ("+5 V supply" is shown here as an example):

+5 V supply	
Disable / Enable	
Upper Fatal:	
Upper Warning:	
Lower Warning:	
Lower Fatal:	

In most cases, we recommend leaving the controls Enabled.

However, if you have an operating system that does not handle system management interrupts, then you might want to disable the controls. When a control is disabled, the sensor itself is still active and able to give valid readings, but no system management interrupt will be generated. A server management utility can collect the readings for information or comparison.

System Management Options	
System Management Mode*	**Disable** Enable
Event Logging*	**Disable** Enable (controls onboard event logging.)
PCI System Error Detection*	**Disable** Enable
Reserved System Resources	

* Enable all three options if you are using server management software.

System Management Mode—if enabled, the embedded Server Management firmware is loaded.

Event Logging—if event logging is enabled, the BIOS can log critical and informational events to nonvolatile flash memory. Critical events are those that normally result in the system being shut down to prevent catastrophic side-effects from propagating to other parts of the system. These are example events:

- Operating system outside of the range of set temperature and voltage limits
- Multibit and parity errors in the memory subsystem
- Most errors that normally generate a Nonmaskable Interrupt (NMI) (including I/O channel check, software generated NMI, and PCI SERR events)

When such errors are detected, the system management interrupt (SMI) routines log the error or event (transparently to the OS) and cause an NMI to be generated for certain fatal events (for example, certain NMIs and uncorrectable ECC errors).

If the OS device driver is using the watchdog timer to detect software or hardware failures, and that timer happens to expire, an Asynchronous System Reset (ASR) is generated. This is equivalent to a hard reset, except that the limit registers are not reset. POST detects this event as the system reboots and will log the event to the logging area.

PCI System Error Detection—when enabled, if a PCI bus error (SERR#) is detected, a critical event is placed in the system event log and an NMI is generated. Enabling this feature has no effect when SMM Mode or Event Logging is disabled.

Server Management

As described in Chapter 1 in this manual, the motherboard includes hardware components that process information about system status and that monitor power supply voltages and operating temperature. You can use server management software to send and log messages about conditions reported if the system is not operating within specified limits.

Some options are required by server management software
If you are using server management software, make sure you select these options in the SCU and Setup; some of the options in the two utilities achieve the same goal, although the menu text differs:

Enable or select this option in SCU	Enable or select this option in Setup
System Management Options, System Management Mode, page 46	SMM Feature, System Management submenu, page 65
Event Logging, page 46*	Event Logging, System Management submenu, page 65
PCI System Error Detection, page 46	System SERR Detection, System Management submenu, page 65
System Sensor Control, page 44**	

* To view an event log, you must have server management software installed.

** The SCU contains menus for entering sensor control values (thresholds), and the BIOS will load defaults from the SCU. Note that server management software may include its own menus for entering threshold values, and these values may overwrite the ones you enter using the SCU menus. For details, refer to the manual that comes with your server management software.

Using Setup

This section describes the BIOS Setup options. Use Setup to change the system configuration defaults. You can run Setup with or without an operating system being present. Setup stores most of the configuration values in battery-backed CMOS; the rest of the values are stored in flash memory. The values take effect when you boot the system. POST uses these values to configure the hardware; if the values and the actual hardware do not agree, POST generates an error message. You must then run Setup to specify the correct configuration.

Run Setup: you may run Setup to modify any standard PC AT† motherboard feature such as:

- Select diskette drive
- Select parallel port
- Select serial port
- Set time / date (to be stored in RTC)
- Configure IDE hard drive
- Specify boot device sequence
- Enable SCSI BIOS

Run SCU, not Setup: you must run the SCU instead of Setup to do the following:

- Add or remove any ISA board that is not Plug and Play-compatible
- Enter or change information about a board
- Set system management threshold values
- Alter system resources (such as interrupts, memory addresses, I/O assignments) to user-selected choices instead of choices selected by the BIOS resource manager
- Specify new values whenever you add or remove memory

Record Your Setup Settings

Record your settings. If the default values ever need to be restored (after a CMOS-clear, for example), you must run Setup again. Your task will be easier if you record Setup settings beforehand.

If You Cannot Access Setup

If the diskette drive is misconfigured so that you cannot access it to run a utility from a diskette, you may need to clear CMOS memory. You will need to open the system, change a jumper setting, use Setup to check and set diskette drive options, and change the jumper back. For a step-by-step procedure, see "CMOS Jumper" in Chapter 4.

How to Enter and Start Setup

You can enter and start Setup under several conditions:

- When you turn on the system, after POST completes the memory test
- When you reboot the system by pressing <Ctrl+Alt+Del> while at the DOS operating system prompt
- When you have moved the CMOS jumper on the motherboard to the "Clear CMOS" position (enabled); for the procedure, see Chapter 4, under the heading "CMOS Jumper"

In the three conditions listed above, after rebooting, you will see this prompt:

```
Press <F2> to enter SETUP
```

If the <F2> prompt does not appear

If the <F2> prompt does not appear, the display of the prompt has been disabled in the SCU. You can enter Setup anyway by pressing <F2> right after the system memory size is shown.

For the procedure to enable the prompt, see "Press <F2> Key to Enter Setup: Prompt Does Not Display" on page 50.

In a fourth condition, when CMOS/NVRAM has been corrupted, you will see other prompts but not the <F2> prompt:

- `Warning: cmos checksum invalid`
- `Warning: cmos time and date not set`

In this condition, the BIOS will load default values for CMOS and attempt to boot.

Press <F2> Key to Enter Setup: Prompt Does Not Display

If the prompt "Press <F2> key to run Setup" does not appear at system startup, then the prompt option has been disabled in the SCU. There are two ways to enable the prompt:

- Reboot the system using your SCU diskette, and go into the SCU to enable the prompt.
- Clear CMOS memory by changing a jumper, and go into the SCU to enable the prompt.

Enable <F2> Prompt by Using SCU

1. Insert your SCU diskette in the diskette drive. This is the diskette that is created by copying the SCU software from the Configuration Software CD that comes with the R440LX motherboard. See "Boot from CD and Copy Configuration Software to Diskettes" on page 28, as necessary.
2. Reboot the system by pressing <Ctrl+Alt+Del> while at the DOS operating system prompt *or* by pressing the reset switch.
3. When the DOS Startup menu appears, select 1 or 2 to enter the SCU.
4. Select step 3, Change Configuration Settings. If a Password menu pops up, enter a user or administrative password if either is enabled, or just press <Esc> to bypass this menu prompt.
5. Select the motherboard.
6. Page down until you reach the Boot Subsystem Group. It is toward the end of the groups.
7. Find and select the option that says, "Display '<F2> for Setup' Message during POST."
8. Press <Enter> to display the option menu.
9. Select Enable and press <Enter>.
10. If you are finished editing the settings for the motherboard, press <Esc>. This takes you back up to the main step 3 menu.
11. Press <Esc> again to return to the main SCU menu.
12. Select step 4, Save Configuration. Once you select this step, the changes are immediately saved into an INF file, a CMS file, and nonvolatile memory.
13. Press <Esc> to exit the SCU. You will be prompted to reboot the system or simply exit to the command line prompt. You'll need to reboot the system to let your changes take effect, but ***first*** remove the SCU diskette drive. ***Then*** press <F10> to reboot.

You should now see the <F2> prompt displayed at bootup.

Enable <F2> Prompt by Changing a Jumper and Using SCU

If you do not have an SCU diskette or CD available, you can clear CMOS memory to enable the <F2> prompt. This means you must change a jumper on the motherboard, run the SCU, save your changes, and change the jumper back to the default setting.

> **This procedure resets *all* to default settings**
> Clearing CMOS memory resets *all* SCU and Setup settings to their defaults, not just the CMOS setting. Before proceeding, check that you have a backup paper copy of configuration settings. Your reconfiguration task will be easier if you record configuration settings beforehand.

1. Observe the safety and ESD precautions stated at the beginning of Chapter 4.
2. Turn off all connected peripherals, turn off system power, and disconnect the AC power cord.
3. Remove chassis cover(s). You do not need to remove the motherboard from the chassis, and you probably do not need to remove any add-in boards.
4. Locate the CMOS configuration pins at the edge of the motherboard. See Chapter 4 for jumper locations.
5. Move the CMOS jumper from the Protect setting on pins 1 and 2 to the Erase setting on pins 2 and 3.
6. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
7. Turn the system on. Wait for POST to complete and for the messages "NVRAM cleared by jumper" and "Press F2 to enter Setup" to appear. This automatically reprograms CMOS and RTC to their default settings.
8. Enter Setup and make any changes necessary. You will need to check and possibly reset all your settings.
9. Press F10 to save the new Setup configuration and exit Setup.
10. Turn off the system, and disconnect the power cord.
11. Again remove the chassis cover(s).
12. Move the jumper from pins 2 and 3 back to pins 1 and 2 (the Protect CMOS memory position).
13. Reinstall the chassis cover(s), and connect the power cord.
14. Turn the system on. Run BIOS Setup and the SCU to verify the correct settings.

Setup Menus

Setup has six major menus and several submenus:

1. Main Menu
    - Primary IDE Master and Slave
    - Secondary Master and Slave
    - Keyboard Features
2. Advanced Menu
    - PCI Configuration
        - — PCI Device, Embedded SCSI
        - — PCI Device, Slot 1 - Slot 4
        - — PCI / PNP ISA UMB Region Exclusion
        - — PCI / PNP ISA IRQ Resource Exclusion
    - Integrated Peripheral Configuration
1. Security Menu
    - Set Supervisor Password
    - Set User Password
2. Server Menu
    - System Management
        - — Server Management Information
    - Console Redirection
1. Boot Menu
    - Boot Device Priority
    - Hard Drive
2. Exit Menu

To navigate the menus:	Press
Get help about an item	<F1>
Go back to a previous item	<Esc>
Select an item or display a submenu	<Enter>
Go to previous item	↑
Go to next Item	↓
Move between menus	← →
Reset to Setup defaults	<F5>
Return to previous values	<F6>
Save and exit Setup	<F10>

When you see this:	What it means
On screen, an option is shown but you cannot select it or move to that field.	You cannot change or configure the option in that menu screen. Either the option is autoconfigured or autodetected, or you must use a different Setup screen, or you must use the SCU.
On screen, the phrase Press Enter appears next to the option.	Press <Enter> to display a submenu that is either a separate full-screen menu or a pop-up menu with one or more choices.

The rest of this section lists the features that display onscreen after you press <F2> to enter Setup. Not all of the option choices are described, because (1) a few are not user-selectable but are displayed for your information, and (2) many of the choices are relatively self-explanatory.

Main Menu

Default values are bold in the following tables.

You can make the following selections on the Main Menu itself. Use the submenus for other selections.

Feature	Choices	Description
System Time	HH:MM:SS	Sets the system time
System Date	MM/DD/YYYY	Sets the system date
Legacy Diskette A:	Disabled 360KB 1.2 MB 720KB **1.44/1.25 MB** 2.88 MB	Selects the diskette type
Legacy Diskette B:	**Disabled** 360KB 1.2 MB 720KB 1.44/1.25 MB 2.88 MB	
Memory Cache	**Enabled** Disabled	Enables Pentium II processor cache
CPU Speed Setting	**133 MHz** **233 MHz** 266 MHz 300 MHz 333 MHz	To activate this field, see “Motherboard Jumpers” in Chapter 4
Language	**English (US)** Spanish Italian French German	Selects which language BIOS displays

Primary IDE Master and Slave

Feature	Choices	Description
Type	**Auto** None CD-ROM User	Auto allows the system to attempt auto-detection of the drive type. None informs the system to ignore this drive. CD ROM allows the manual entry of fields described below. User allows the manual entry of all fields described below.
Cylinders	1 to 2048	Number of Cylinders on Drive. This field is changeable only for Type User. This field is informational only for Type Auto.
Heads	1 to 16	Number of read/write heads on drive. This field is available only for Type User. This field is informational only for Type Auto.
Sectors	1 to 64	Number of sectors per track. This field is available only for Type User. This field is informational only for Type Auto.
Maximum Capacity	N/A	Computed size of drive from cylinders, heads, and sectors entered. This field is available only for Type User. This field is informational only for Type Auto.
Multi-Sector Transfer	Disabled 2, 4, 8, or 16 sectors	Determines the number of sectors per block for multi-sector transfers. This field is informational only for Type Auto.
LBA Mode Control	Disabled Enabled	Enabling LBA causes logical block addressing to be used in place of cylinders, heads, and sectors. This field is informational only for Type Auto.
32 Bit I/O	**Disabled** Enabled	Enabling allows 32 bit IDE data transfers. This field is informational only for Type Auto.
Transfer Mode	Standard Fast PIO 1 Fast PIO 2 Fast PIO 3 Fast PIO 4	Selects the method for moving data to and from the drive. This field is informational only for Type Auto.

Secondary Master and Slave

Feature	Choices	Description
32 Bit I/O	**Disabled** Enabled	Enabling allows 32 bit IDE data transfers. This field is informational only for Type Auto.
Smart Monitoring	Disabled	Not available.

Keyboard Features

Feature	Choices	Description
Num Lock	**Auto** On Off	Selects power-on state for Num Lock
Key Click	**Disabled** Enabled	Enables or disables key click
Keyboard auto-repeat rate	**30/sec** 26.7/sec 21.8/sec 18.5/sec 13.3/sec 10/sec 6/sec 2/sec	Selects key repeat rate
Keyboard auto-repeat delay	1/4 sec **1/2 sec** 3/4 sec 1 sec	Selects delay before key repeat

Advanced Menu

The Advanced Menu includes selections that take you to two other configuration menus:

1. PCI configuration, which includes the following submenus:
   - PCI Device, Embedded SCSI
   - PCI Device, Slot 1 - Slot 4
   - PCI/PNP/ ISA UMB Region Exclusion
   - PCI/PNP ISA IRQ Resource Exclusion
2. Integrated Peripheral Configuration.

You can make the following selections on the Advanced Menu itself. Use the submenus for the three other selections that appear on the Advanced Menu.

Feature	Choices	Description
Plug and Play OS	**No** Yes	Select Yes if you are booting a Plug and Play capable operating system.
Reset Configuration Data	**No** Yes	Select Yes if you want to clear the system configuration data during next boot. System automatically resets to No in next boot.
Use Multiprocessor Specification	**1.1** 1.4	Selects the version of multiprocessor specification to use. Some operating systems require version 1.1.
Large Disk Access Mode	**DOS** Other	Select DOS if your OS is DOS, or Other for UNIX, Novell† NetWare†, or other OS.
Enable Memory Gap	**Disabled** Extended	Conventional creates a 128KB system memory gap starting at 512KB. Extended creates a 1MB extended memory gap starting at 15MB.
Delay on Option ROMs	**Disabled** Enabled	Forces a short delay at the end of each Option ROM scan.

PCI Configuration

The PCI Configuration Menu only contains selections that access other submenus.

PCI Device, Embedded SCSI

Feature	Choices	Description
Option ROM Scan	**Enabled** Disabled	Enables option ROM scan of the selected device.
Enable Master	**Enabled** Disabled	Enabled selects the device as a PCI bus master.
Latency Timer	Default 0020h **0040h** 0060h 0080h 00A0h 00C0h 00E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus.

PCI Device, Slot 1 - Slot 4

Feature	Choices	Description
Option ROM Scan	**Enabled** Disabled	Enables option ROM scan of the selected device.
Enable Master	**Enabled** Disabled	Enables selected device as a PCI bus master.
Latency Timer	Default 020h **040h** 060h 080h 0A0h 0C0h 0E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus.

PCI/PNP ISA UMB Region Exclusion

Feature	Choices	Description
C800 - CBFF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.
CC00 - CFFF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.
D000 - D3FF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.
D400 - D7FF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.
D800 - DBFF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.
DC00 - DFFF	**Available** Reserved	Reserves the specified block of upper memory for use by legacy ISA devices.

PCI/PNP ISA IRQ Resource Exclusion

Feature	Option	Description
IRQ 3	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 4	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 5	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 7	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 9	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 10	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 11	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.
IRQ 15	**Available** Reserved	Reserves the specified IRQ for use by legacy ISA devices.

Integrated Peripheral Configuration

Feature	Choices	Description
Serial Port A	Disabled **Enabled** Auto PnP OS	 Auto forces BIOS to configure the port. PnP OS forces OS configures the port.
Base I/O Address	**3F8** 2F8 3E8 2E8	Selects the base I/O address for COM port A
Interrupt	**IRQ 4** IRQ 3	Selects the IRQ for COM port A.
Serial Port B	Disabled **Enabled** Auto PnP OS	 Auto forces BIOS to configure the port. PnP OS forces OS configures the port.
Mode	**Normal** IrDA ASK-IR	Selects serial port B mode.
Base I/O Address	3F8 **2F8** 3E8 2E8	Selects the base I/O address for COM port B.
Interrupt	IRQ 4 **IRQ 3**	Selects the IRQ for COM port B.
Parallel Port	Disabled **Enabled** Auto PnP OS	 Auto forces BIOS to configure the port. PnP OS forces OS configures the port.
Mode	Output only Bi-directional EPP **ECP**	Selects parallel port mode.
Base I/O Address	**378** 278	Selects the base I/O address for LPT port.

Continued

Feature	Choices	Description
Interrupt	IRQ 5 **IRQ 7**	Selects the IRQ for LPT port.
DMA channel	**DMA 1** DMA 3	Selects the DMA for LPT port.
Floppy disk controller	Disabled **Enabled**	Enables onboard diskette controller.
Base I/O Address	**Primary** Secondary	Selects base I/O address for diskette controller.
PS/2 Mouse	Disabled **Enabled**	Enables or disables onboard mouse. Disabling the mouse frees up IRQ 12. If enabled, the OS can determine whether to enable or disable the mouse.

Security Menu

You can make the following selections on the Security Menu itself. Enabling the Supervisor Password field requires a password for entering Setup. The passwords are not case sensitive.

Feature	Choices	Description
Administrator Password is	**Clear**	Status only; user cannot modify.
User Password is	**Clear**	Status only; user cannot modify. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on motherboard (see Motherboard Jumpers in Chapter 4).
Set Administrative Password	Press Enter	When the <Enter> key is pressed, the user is prompted for a password; press ESC key to abort. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on motherboard (see Motherboard Jumpers in Chapter 4).
Set User Password	Press Enter	When the <Enter> key is pressed, the user is prompted for a password; press ESC key to abort. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on motherboard (see Motherboard Jumpers in Chapter 4).
Password on Boot	**Disabled** Enabled	Requires password entry before boot. System will remain in secure mode until password is entered. Password on Boot takes precedence over Secure Mode Boot.
Diskette Access	**Administrator** User	Controls access to diskette drives.
Fixed Disk Boot Sector	**Normal** Write Protect	Write-protects boot sector on hard disk to protect against viruses.

Continued

Feature	Choices	Description
System Backup Reminder	**Disabled** Daily Weekly Monthly	Displays reminder message at boot.
Virus Check Reminder	**Disabled** Daily Weekly Monthly	Displays reminder message at boot.
Secure Mode Timer	**Disabled** 1 min 2 min 5 min 10 min 20 min 1 hr 2 hr	Period of key/PS/2 mouse inactivity specified for secure mode to activate. A password is required for secure mode to function. Cannot be enabled unless at least one password is enabled.
Secure Mode Hot Key (Ctrl-Alt-)	[ ] [A, B, ..., Z]	Key assigned to invoke the Quicklock feature. Cannot be enabled unless at least one password is enabled.
Secure Mode Boot	**Disabled** Enabled	System will boot in secure mode. The user must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.
Video Blanking	**Disabled** Enabled	Blank video when secure mode is activated. The user must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.
Floppy Write Protect	**Disabled** Enabled	When secure mode is activated, the diskette drive is write protected. The user must enter a password to disable. Cannot be enabled unless at least one password is enabled.
Front Panel Lockout	**Disabled** Enabled	When secure mode is activated, the reset and power switches are locked. The user must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.

Server Menu

The Server Menu includes selections that take you to two other configuration menus:

1. System Management
    - Server Management Information
2. Console Redirection

You can make the following selections on the Server Menu itself.

Feature	Choices	Description
PCI IRQs to IO-APIC mapping	**Disabled** Enabled	If enabled, BIOS will describe direct PCI interrupt connections to IO APIC in multiprocessor table. Do not enable if OS does not support this feature.
PCI IRQ to External MUX	**Disabled** Enabled	Routes PCI IRQs to external multiplexer (MUX) and inputs PIIX4. Disables PIIX4 MUX.
Processor Retest	**No** Yes	If YES, BIOS clears historical processor status and retests all processors on next boot.

System Management

Feature	Choices	Description
IMB User Defaults	**Disabled**	If enabled, IMB user default settings will be programmed.
System Management Mode	**Disabled** Enabled	Enabled loads the embedded server management firmware.
System Event Logging	**Disabled** Enabled	When enabled, system events will be logged by BIOS and BMC.
Clear Event Log	**No** Yes	Yes clears the system event log.
Fault Resilient Booting	**Disabled** Lvl-1 Lvl-2 Lvl-3	Determines level of Fault Resilient Booting. See Processor Board Controller in the Server Management section of Chapter 1 for more information.
PERR Reporting	**Disabled** SMI Only SMI &NMI	If selected, system detects and reports PERR on PCI buses.
SERR Reporting	**Disabled** Enabled	Enabled generates a PCI bus system error report.
Test Extended Memory	**Enabled** Disabled	Diagnostic option only.
SMM Debug Mode	**Enabled** Disabled	If enabled, the SMM outputs to video and Port 80.
CPU Slot1 and Slot2 Presence	**Enabled** Disabled	Enables or disables processor at Slot1 or Slot 2.

Server Management Information

No items on this menu can be modified by the user. If items require changes, consult your system administrator.

Feature	Choices	Description
Board Part Number	N/A	Information field only
Board Serial Number	N/A	Information field only
System Part Number	N/A	Information field only
System Serial Number	N/A	Information field only
Chassis Part Number	N/A	Information field only
Chassis Serial Number	N/A	Information field only
BMC Revision	N/A	Information field only
FPC Revision	N/A	Information field only
PBC Revision	N/A	Information field only
Primary HSBP Revision	N/A	Information field only
Primary HSBP Part Number	N/A	Information field only
Primary HSBP Serial Number	N/A	Information field only
Secondary HSBP Revision	N/A	Information field only
Secondary HSBP Part Number	N/A	Information field only
Secondary HSBP Serial Number	N/A	Information field only
Power Share Revision	N/A	Information field only
Power Share Part Number	N/A	Information field only
Power Share Serial Number	N/A	Information field only

Console Redirection

Feature	Choices	Description
COM Port Address	**Disabled** 3F8 2F8 3E8	When enabled, console redirection uses the I/O port specified.
IRQ #	3 or 4	When console redirection is enabled, this displays the IRQ assigned per the address chosen in the COM Port Address field.
Baud Rate	9600 **19.2k** 38.4k 115.2k	When console redirection is enabled, use the baud rate specified.
Flow Control	None CTS/RTS XON/XOFF **CTS/RTS + CD**	None disallows flow control. CTS/RTS is hardware flow control. XON/XOFF is software flow control. CTS/RTS +CD is hardware plus carrier-detect flow control.

Boot Menu

The Boot Menu includes selections that take you to two other configuration menus:

1. Boot Device Priority
2. Hard Drive

Items on the Boot Menu can be prioritized. Use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

You can make the following selections on the Boot Menu itself.

Feature	Choices	Description
Floppy Check	**Disabled** Enabled	If Enabled, system verifies diskette type on boot. Disabled results in a faster boot.
Summary Screen	Disabled **Enabled**	If Enabled, system displays system configuration during boot.

Boot Device Priority

Boot Priority	Device	Description
1.	Diskette Drive	Attempts to boot from drive A:
2.	Removable Devices	Attempts to boot from a removable media device.
3.	Hard Drive	Attempts to boot from a hard drive device.
4.	ATAPI CD-ROM Drive	Attempts to boot from an ATAPI CD-ROM drive.
5.	Diagnostic boot	Attempts to boot from diagnostic boot partition of the flash memory.

Hard Drive

For options on this menu, use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

Option	Description
1. Other Bootable Device	N/A
2. WDC AC21600H	N/A

Exit Menu

You can make the following selections on the Exit Menu. Select an option using the up or down arrow keys, then press <Enter> to execute the option. Pressing <Esc> does not exit this menu. You must select one of the items from the menu or menu bar to exit.

Choices	Description
Exit Saving Changes	Exits after writing all modified Setup item values to NVRAM.
Exit Discarding Changes	Exits leaving NVRAM unmodified.
Load Setup Defaults	Loads values of all Setup items from previously saved custom defaults.
Load Custom Defaults	Loads default values for all Setup items.
Save Custom Defaults	Saves present Setup values to custom defaults.
Discard Changes	Reads previous values of all Setup items from NVRAM.
Save Changes	Writes all Setup item values to NVRAM.

Using SCSI*Select*

The SCSI*Select* utility detects the number of AIC-7880 wide/fast-20 SCSI III host adapters in the system. Use the utility to:

- Change default values
- Check or change SCSI device settings that may conflict with those of other devices in the system
- Perform a low-level format on SCSI devices installed in the system

How to Enter and Start SCSI*Select*

1. Turn on your video monitor and system. After a few seconds POST begins to run. After the memory tests are completed, if you do *not* choose to enter Setup and you *do* have an operating system installed, a SCSI*Select* prompt will appear. Record your settings.

   ```
   Press <Ctrl><A> for SCSISelect(TM) Utility!
   ```

2. Press <Ctrl+A> to run the utility.

SCSI*Select* has these menus:

1. Main Menu
   - Configuration
     - Boot Device Configuration
     - SCSI Device Configuration
     - Advanced Configuration Options
   - SCSI Disk Utilities
2. Exit Menu

To navigate the menus:	Press
Exit a menu or the utility	<Esc>
Select an item	<Enter>
Go to previous item	↑
Go to next item	↓
Reset to host adapter defaults	<F6>

Main Menu, SCSI*Select*

The main SCSI*Select* menu shows the name of the host adapter and its address: <Host adapter> at Bus:Device xx:xxh. There are two menu options.

Options	Comment
Configure/View Host Adapter Settings	Press <Enter> to display the Configuration menu.
SCSI Disk Utilities	Press <Enter> to display the SCSI Disk Utilities menu. The utility scans for all SCSI devices installed in the system and lists them. Press <Enter> to select the device you want to run utilities on. The default ID for the SCSI host adapter is #7. If you select the host adapter, you will see only a message stating that fact; you cannot specify any options for the host adapter from the utilities menu.

Configuration Menu, SCSI*Select*

Feature	Default	Choices
SCSI Bus Interface Definitions		
Host Adapter SCSI ID	7	0 - 15
SCSI Parity Checking	Enabled	Enable/Disable
Host Adapter SCSI Termination	Low ON/High ON	Low ON/High ON Low OFF/High OFF Low OFF/High On
Additional Options		
Boot Device Options	Press <Enter>	See Boot Device Options, SCSI*Select*.
SCSI Device Configuration	Press <Enter>	See SCSI Device Configuration, SCSI*Select*.
Advanced Configuration Options	Press <Enter>	See Advanced Configuration Options, SCSI*Select*.

Host Adapter SCSI ID—Each device on the SCSI bus, including the adapter, must have a unique ID. The ID defines the device, and the priority of the ID determines which device controls the bus when two or more devices try to use it at the same time. Each adapter on the bus, whether 8- or 16-bit, has a default ID of 7, so the adapter always has the highest priority. This is the priority model:

Device priority model	Highest priority ID	Lowest priority ID
8-bit devices (narrow SCSI)	7	0
16-bit devices (wide SCSI) (In this case, ID 7 has the highest priority and ID 8 the lowest)	7 through 0	15 through 8

SCSI Parity Checking—when enabled, the host adapter uses SCSI parity checking to verify the accuracy of data transfer on the SCSI bus. If a device on the bus does not support SCSI parity, the option must be disabled.

Host Adapter SCSI Termination—the setting for this option is determined by (1) the location of the host adapter on the bus and (2) whether the SCSI devices connected to the bus are narrow, wide, or a combination. The bus must have a set of resistors, called *terminators*, either installed in or enabled on the first and last SCSI devices on the bus, or else data transfer may not be accurate. The host adapter itself is the SCSI device at one end of the bus,

and termination on the adapter cannot be disabled. On a 16-bit adapter, termination is enabled for both the low byte (bits 0-7) and the high byte (bits 8-15). If there is no 8-bit adapter at the end of the bus, you must disable termination by using the option in the SCSI*Select* Configuration menu. This is the termination model:

Host adapter location	SCSI devices connected to bus	Host Adapter SCSI Termination choice
Installed at end of bus	***only*** 8-bit, ***or*** ***only*** 16-bit	Low ON/High ON (default)
Installed at end of bus	***both*** 8-bit and 16-bit	Low ON/High ON (same as default) **Note:** Last device must be 16-bit and terminated.
Not at end of bus*	***only*** 16-bit	Low OFF/High OFF
Not at end of bus*	***both*** 8-bit and 16-bit	Low OFF/High On

* In this system, the host adapter on the motherboard is always at one end of the bus.

Boot Device Options, SCSI*Select*

Feature	Option	Comment
Boot Target ID	0–15	The default boot device is at SCSI ID 0 with logical unit number (LUN) 0. To specify a different boot device, choose a different SCSI ID (0 through 7 on 8-bit adapters, 0 through 15 on 16-bit adapters).
Boot LUN Number	0–7	The logical unit number (LUN) can be 0 through 7 (on 8-bit or 16-bit adapters). If you disable Multiple LUN Support in the Advanced Configuration menu, specifying a number here has no effect.

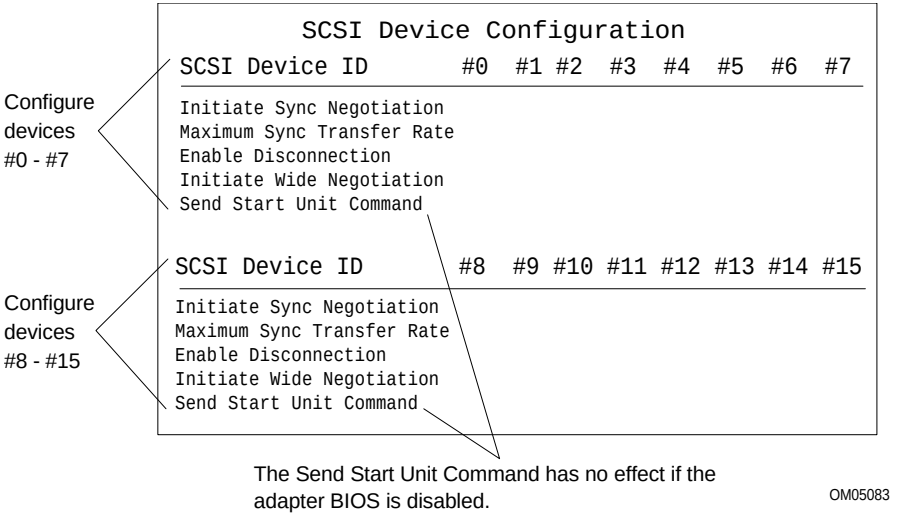
Boot Target ID—The default boot device is the device at SCSI ID 0 with logical unit number (LUN) 0. To specify a different boot device, choose a different SCSI ID (0 through 7 on 8-bit adapters, 0 through 15 on 16-bit adapters).

Boot LUN Number—If the boot device has multiple logical units, you must also specify the boot logical unit number (LUN). This can be 0 through 7 (on 8-bit or 16-bi5t adapters). Multiple LUN support can be disabled in the SCSI*Select* Advanced Configuration menu.

SCSI Device Configuration, SCSI*Select*

The screen shows five features that can be configured independently for each of up to 15 devices (SCSI Device ID #0 through #15)

Feature	Default	Choices
Initiate Sync Negotiation	Yes	Yes/No
Maximum Sync Transfer Rate	40.0 for 16-bit 20.0 for 8-bit	16-bit devices: 20.0, 26.8, 32.0, 40.0 8-bit devices: 10, 13.4, 16.0, 20.0
Enable Disconnection	Yes	Yes/No
Initiate Wide Negotiation	Yes	Yes/No
Send Start Unit Command	Yes	Yes/No No effect if the BIOS is disabled.


SCSI Device Configuration
SCSI Device ID #0 #1 #2 #3 #4 #5 #6 #7
Initiate Sync Negotiation
Maximum Sync Transfer Rate
Enable Disconnection
Initiate Wide Negotiation
Send Start Unit Command
SCSI Device ID #8 #9 #10 #11 #12 #13 #14 #15
Initiate Sync Negotiation
Maximum Sync Transfer Rate
Enable Disconnection
Initiate Wide Negotiation
Send Start Unit Command
Configure devices #0 - #7
Configure devices #8 - #15
The Send Start Unit Command has no effect if the adapter BIOS is disabled.
OM05083

Initiate Sync Negotiation—when enabled (set to Yes), the host adapter initiates synchronous negotiation with the SCSI device; when No, the adapter does not initiate synchronous negotiation. Normally you should leave this set to Yes, because the SCSI adapter and its attached devices can transfer data faster in synchronous mode than in asynchronous. If a device

does not support synchronous negotiation, the adapter will automatically transfer data asynchronously. If the device initiates synchronous negotiation, the host adapter always responds accordingly.

Maximum Sync Transfer Rate—the setting determines the maximum synchronous data transfer rate that the adapter will negotiate with the device. If you have disabled (set to No) the Initiate Sync Negotiation option, the maximum sync rate you select is the rate at which the adapter accepts data from the device; there is no negotiation.

Enable Disconnection—when set to Yes, the adapter allows a SCSI device to temporarily disconnect from the bus, and the adapter can continue to do other bus operations. When no, the adapter does not allow a SCSI device to disconnect.

- Leave this set to Yes if there are two or more SCSI devices on the bus.
- Change to No if there is only one SCSI device connected to the bus (besides the adapter).

Initiate Wide Negotiation—when set to Yes, the adapter initiates wide negotiation with each 16-bit SCSI device. You can leave this set to Yes even if there are 8-bit devices connected; the adapter will not attempt wide negotiation with 8-bit devices.

Send Start Unit Command—this option reduces the load on the system power supply by allowing the host adapter to power-up SCSI devices one at a time at boot time.

- Yes is required for SCSI hard drives; the adapter sends the Start Unit Command to each SCSI device individually to power-up.
- When set to No, all SCSI devices power up at the same time. If a device has been jumpered to wait for a start command, it will not start.

If you enable the command for more than one device, the adapter sends the command first to the boot device specified in the Boot Device Options menu (page 73). After the first device responds, the adapter sends the command to the remaining SCSI devices, beginning with the lowest SCSI ID.

⇒ **Do not enable the Send Start Unit option before checking...**
Make sure the AIC-7880 BIOS option is enabled (see Advanced Configuration Options, page 76).

Check the manual that comes with your SCSI device to make sure the device supports the command. If so, it is likely that you will need to change a switch or jumper setting on the device so it can respond to the command.

Advanced Configuration Options, SCSI*Select*

Feature	Default	Choices
If you disable the Host Adapter BIOS option, the following options have no effect.		
Host Adapter BIOS (Configuration Utility Reserves BIOS Space)	Enabled	Enable/Disable
Support Removable Disks Under BIOS as Fixed Disks	Boot Only	Boot Only All Disks Disable
Extended BIOS Translation for DOS Drives greater than 1 GB	Enabled	Enable/Disable
Display <Ctrl-A> Message During BIOS Initialization	Enabled	Enable/Disable
Multiple LUN Support	Disabled	Enabled/Disable
BIOS Support for Bootable CD-ROM	Enabled	Enable/Disable
BIOS Support for Int13 Extensions	Enabled	Enable/Disable
Support for Ultra SCSI Speed	Enabled	Enable/Disable

CAUTION, understand the options before changing defaults
Do not change the default settings in the SCSI*Select* Advanced Configuration Options menu without understanding the consequences of making changes.

Host Adapter BIOS—The AIC-7880 BIOS must be enabled to allow these actions:

- Boot from a SCSI hard drive on the bus.
- Enable any of the other options listed on the same menu (Advanced Configuration Options).
- Boot from a SCSI CD-ROM drive. If any IDE devices are selected in the boot order, they will be chosen first over the SCSI device.

If the devices on the SCSI bus are controlled by device drivers and thus do not need a BIOS, you can disable the option. This frees about 16 KB of memory and shortens the boot time by up to 60 seconds. However, 2 KB of memory space is still reserved per PCI and Plug and Play specifications.

Support Removable Disks Under BIOS as Fixed Disks (i.e., hard disks)—the setting controls how removable-media devices are supported by the AIC-7880 BIOS. The choices are:

Choice	Description
Boot Only (default)	Only the removable-media drive designated as the boot device is treated as a fixed (hard) disk drive. The AIC-7880 BIOS must be enabled.
All Disks	All removable-media drives supported by the AIC-7880 BIOS are treated as fixed drives. (If you are a NetWare user: all removable-media drives are automatically supported by NetWare as fixed disks regardless of how you set this option.) The AIC-7880 BIOS must be enabled.
Disabled	No removable-media drives running under DOS are treated as fixed drives. Driver software is needed because the drives are not controlled by the AIC-7880 BIOS.

CAUTION, do not remove media from drive under BIOS control
Do not remove media from a removable media drive if the drive is under the control of the AIC-7880 BIOS.

Extended BIOS Translation for DOS Drives > 1 GB—when Enabled, drives handled by the AIC-7880 BIOS can use extended translation (255 heads, 63 sectors per track) if their formatted capacity is greater than 1 GB and standard translation if smaller than 1 GB.

CAUTION, before changing option, back up hard disks!
First back up the hard disks if you need to change this setting and the translation scheme! All data is erased when you change from one translation scheme to another.

Display <Ctrl-A> Message During BIOS Initialization—if Enabled, at boot time a prompt displays to let you run the SCSI*Select* program.

Multiple LUN Support—the default setting is Disabled. Enable the option if any devices have multiple logical units.

BIOS Support for Bootable CD-ROM—when enabled, the system can boot from a CD-ROM. The option displays only if the adapter BIOS is configured to include it. To boot from a hard drive or other device, either disable this option or make sure there is no bootable CD in the drive.

BIOS Support for Int 13 Extensions—when enabled, the adapter BIOS supports Int 13h extensions, required for bootable CD-ROMs. The option displays only if the adapter BIOS is configured to include bootable CD-ROM support. You can disable the option if the boot device is *not* a CD-ROM, but it does no harm to leave it enabled.

Support for *Ultra*SCSI Speed—the default setting is Disabled. The option displays only if the BIOS is configured to support *Ultra*SCSI speeds. Enable the option to use *Ultra*SCSI speeds with the AIC-7880.

SCSI Disk Utilities Menu, SCSI*Select*

When you select SCSI Disk Utilities from the SCSI*Select* Main Menu, the utility scans the SCSI bus for connected devices and lists the SCSI IDs and associated devices on the bus.

From the list of devices, select the one you want to format or verify.

If a device has multiple logical units, a menu of LUNs appears.

Select the device you want to format or verify. A small menu appears. Select Format Disk or Verify Disk.

Utility	What it does	Comment
Format Disk	Does a low-level format on the hard disk drive. Before it starts, a prompt appears asking you to confirm that you want to format the hard disk.	**CAUTION** You cannot stop the formatting once it starts! Do NOT answer yes unless you intend to format the disk.
Verify Disk Media	Scans the selected hard disk for bad blocks and prompts you to reassign them.	You can press <Esc> at any time to stop the verification task.

Exit Menu, SCSI*Select*

Feature	Option	Comment
Exit Utility?	Yes No	When you finish configuring SCSI devices, select “Yes” and press <Enter>. This message appears: `Please press any key to reboot`

Installing Video Drivers

After configuring the system, you need to install video drivers to take full advantage of the features of the onboard Cirrus Logic CL-GD5446 super VGA video controller.

- The Configuration Software CD includes video drivers for use with DOS and Windows† NT†. Check the README.TXT file on the CD for information on installing these drivers.
- For other operating systems, see your OS instructions for installing device drivers.

Configuring the Network Controller

This system includes the onboard Intel 82557 PCI LAN Controller. The IRQ level and I/O address of the onboard controller are automatically set each time you start the system. PCI systems automatically detect and configure PCI-compliant adapters while booting.

For information about network software and configuration, refer to the Configuration Software CD shipped with this motherboard.

□ □ □

Integrating and Upgrading Hardware 3

This chapter tells how to install and remove major system components.

Tools and Supplies Needed

- Phillips (cross-head) screwdriver (#1 bit and #2 bit)
- Small flat-bladed screwdriver
- Jumper removal tool or needle-nosed pliers
- Tweezers
- Antistatic wrist strap (recommended)
- Rubber gloves
- Pen or pencil
- Equipment log: as you integrate new parts into the system, add information about them to an equipment log. Record the model and serial number of the system, all installed options, and any other pertinent information specific to the system. You will need this information when running the SCU.

Cautions

CAUTIONS

Electrostatic discharge (ESD) and ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you do all procedures in this chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from a system, place it component-side up on a grounded, static-free surface. If you place the motherboard on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery. Use a conductive foam pad if available but not the board wrapper. Do not slide boards over any surface.

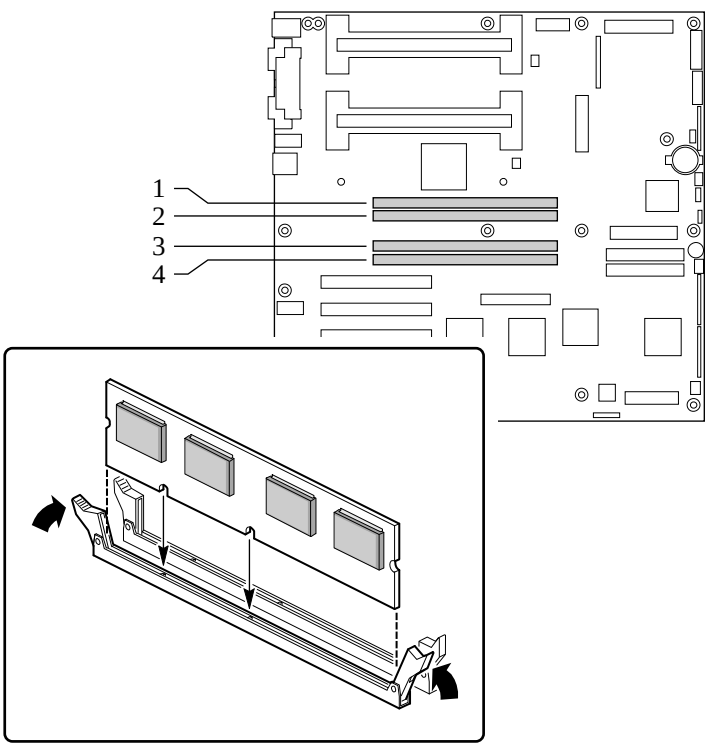
Memory, Installing DIMMs

CAUTION, use care when installing DIMM
Use extreme care when installing a DIMM. Applying too much pressure can damage the socket. DIMMs are keyed and can be inserted in only one way.

CAUTION, match metal types
Mixing dissimilar metals may cause later memory failures resulting in data corruption. Install DIMMs with gold plated edge connectors only in gold plated sockets.

See Chapter 1 for memory size and requirements:

- Install from 32 MB to 512 MB of memory, using up to four single- or double-banked DIMMs.



Installation and locations of memory DIMM sockets

OM06417

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Holding the DIMM only by its edges, remove it from its antistatic package.
3. Orient the DIMM so that the two notches in the bottom edge of the DIMM align with the keyed socket.
4. Insert the bottom edge of the DIMM into the socket, and press down firmly on the DIMM until it seats correctly.
5. Gently push the plastic ejector levers on the socket ends to the upright position.
6. Repeat the steps to install each DIMM.
7. Run the SCU to configure the system and to properly attribute ECC memory.

Make sure you run the SCU to configure ECC memory
Failure to do so may degrade the performance of the server.

Memory, Removing DIMMs

CAUTION, use care when removing DIMM
Use extreme care when removing a DIMM. Too much pressure can damage the socket slot. Apply only enough pressure on the plastic ejector levers to release the DIMM.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Gently push the plastic ejector levers out and down to eject a DIMM from its socket. Refer to the figure, “Installation and locations of memory DIMM sockets” on page 82, as necessary.
3. Hold the DIMM only by its edges, being careful not to touch its components or gold edge connectors. Carefully lift it away from the socket, and store it in an antistatic package.
4. Repeat to remove other DIMMs as necessary.
5. Run the SCU to configure the system and to properly attribute ECC memory.

Drive Cabling Considerations

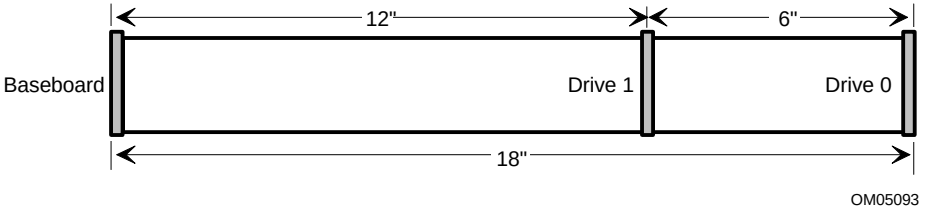
This section summarizes device cabling requirements and constraints. The number of devices you can install depends on:

- The number supported by the bus
- The number of physical drive bays available in your chassis
- The height of drives in the internal chassis bays
- The combination of SCSI and IDE devices

IDE Requirements

If you install an IDE hard drive, we recommend placing it in the lowest internal drive bay to make cabling easier, particularly if you also have an IDE device in an externally accessible bay.

For proper IDE operation, note the cable length specified in the following figure. If no drives are present on an IDE channel, the cable must be removed. If only one drive is installed, it must be connected at the end of the cable.



To disable either IDE controller
If you plan to disable either IDE controller to reuse the interrupt for that controller, you must physically unplug the IDE cable from the board connector (IDE0 or IDE1) if a cable is present. Simply disabling the drive by configuring the SCU option does not free up the interrupt.

SCSI Requirements

All SCSI devices must be unterminated except the peripheral at the end of the SCSI cable. Hard drives usually provide an active termination, while CD-ROM drives do not. Because we recommend putting hard drives only in internal chassis bays, this means that you should route the SCSI cable so that the last device on the cable is a hard drive in an internal bay.

If the ONLY SCSI device installed is a CD-ROM drive, an active terminator on the drive is not required, but this is an unlikely system configuration.

In general, the SCSI cable must be routed from the connector at the motherboard to any 5.25-inch SCSI devices in external bays, and finally to internal 3.5-inch SCSI hard drives.

Motherboard, Removing

See your chassis manual for detailed instructions on removing and installing the motherboard.

Note
You will need a Phillips (#2 bit) screwdriver.

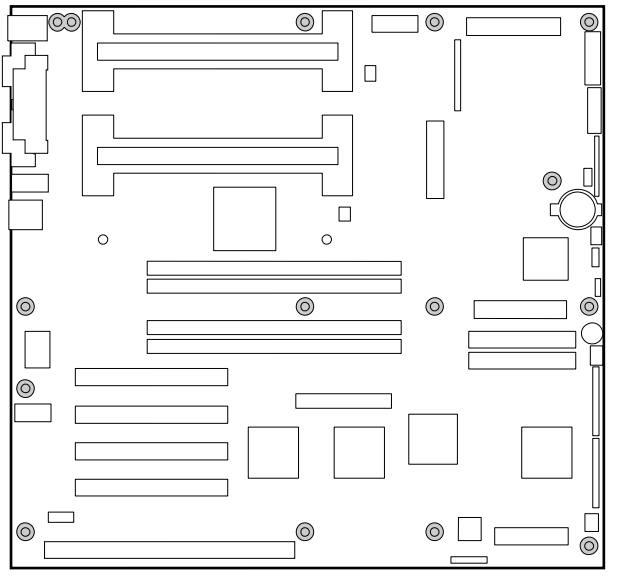
WARNING

This procedure should be done only by qualified technical personnel. Unplug the server before doing the procedures described here. Failure to disconnect the power before you open the server can result in personal injury or equipment damage.

CAUTION
The motherboard can be extremely sensitive to ESD and always requires careful handling. After removing it from the system, place it component-side up on a nonconductive, static-free surface to prevent shorting out the battery leads. If you place the board on a conductive surface, the battery leads may short out. This will result in a loss of CMOS data and will drain the battery. Do not slide the motherboard over any surface.

CAUTION
If you place the motherboard on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery.

The motherboard is secured to the chassis by 15 screws. The locations of the mounting screw holes are shaded in the figure below.



Mounting screw holes (shaded)

OM06418a

Back-up Battery

The lithium battery on the motherboard powers the real-time clock (RTC) for up to 10 years in the absence of power. When the battery starts to weaken, it loses voltage, and the system settings stored in CMOS RAM in the RTC (for example, the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.

WARNING
If your system has been running, any installed processor and heat sink will be hot. To avoid the possibility of a burn, be careful when removing or installing motherboard components that are located near processors.

The following warning and translations are required by specific certifying agencies to be printed immediately adjacent to the procedure for removing the RTC.

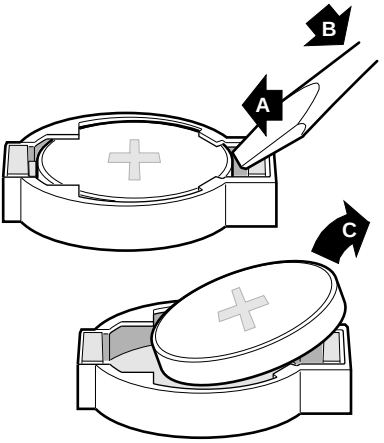
WARNING
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

ADVARSEL!
Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

ADVARSEL
Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

VARNING
Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS
Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

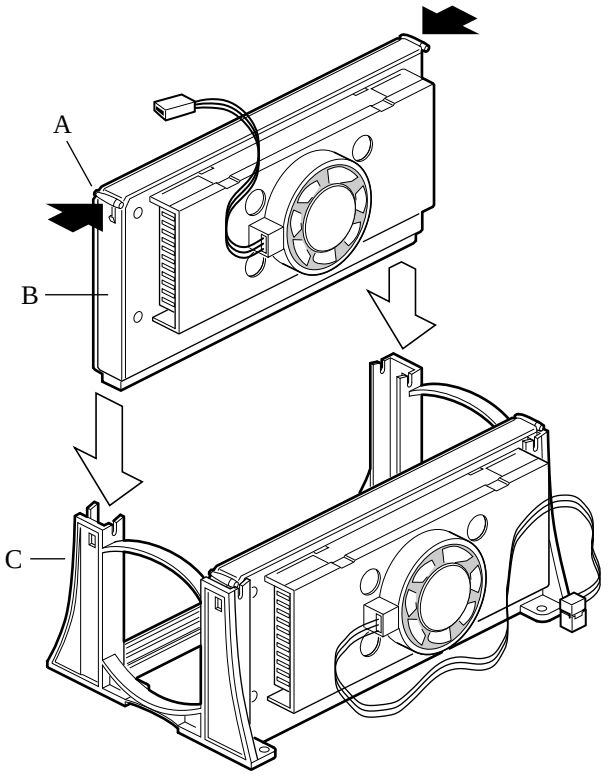


Replacing lithium battery

OM06416a

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Insert the tip of a small flat-bladed screw driver, or equivalent, under the plastic tab on the snap-on plastic retainer (A in figure).
3. Gently push down on the screwdriver to lift the battery (B).
4. Remove the battery from its socket (C).
5. Dispose of the battery according to local ordinance.
6. Remove the new lithium battery from its package, and, being careful to observe the correct polarity, insert it in the battery socket.
7. Reinstall the plastic retainer on the lithium battery socket.
8. Run the SCU to restore the configuration settings to the RTC.

Processor, Installing



OM06347

A Processor latches; must be pushed inward
B Processor in S.E.C. cartridge
C Retention mechanism

CAUTION, processor must be appropriate
You may damage the motherboard if you install an inappropriate processor. Make sure your motherboard and system can handle a newer, faster processor (thermal and power considerations). For exact information about processor interchangeability, contact your customer service representative.

CAUTION, single-processor configurations require termination board

The R440LX motherboard can have either one or two processors. If you install only one processor, it must go in the Slot 1 primary connector (closest to the DIMM connectors and the center of the motherboard); you must also install a termination board in the Slot 1 secondary connector (closest to the edge of the motherboard).

CAUTION, ESD and handling processors

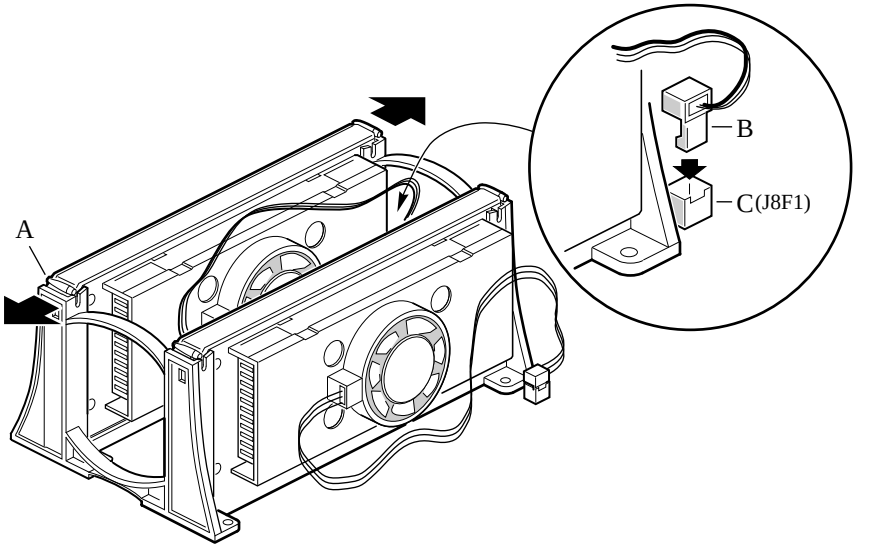
Do not touch or bend the processor's exposed pins. Reduce the risk of electrostatic discharge (ESD) damage to the processor by doing the following: (1) Touch the metal chassis before touching the processor or motherboard. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor. (2) Avoid moving around unnecessarily.

1. Observe the safety and ESD precautions at the beginning of this chapter and the additional cautions given here.
2. Remove the new processor from its antistatic package and place it on a grounded, static-free surface or conductive foam pad.
3. Orient the processor so that the fan heat sink faces the center of the motherboard. Slide the processor into the retention mechanism. See figure on page 90. Ensure that the alignment notch in the S.E.C. cartridge fits over the plug in Slot 1. Push down firmly, with even pressure on both sides of the top, until the S.E.C. cartridge is seated.

4. To lock in the processor, push the latches outward until they click into place in the retention mechanism (A in figure, below). The latches must be secured for proper electrical connection of the processor

5. Attach the small end of the power cable to the fan connector on the S.E.C. cartridge, then attach the large end (B) to the three-pin connector on the motherboard (C).

Locking in the processor



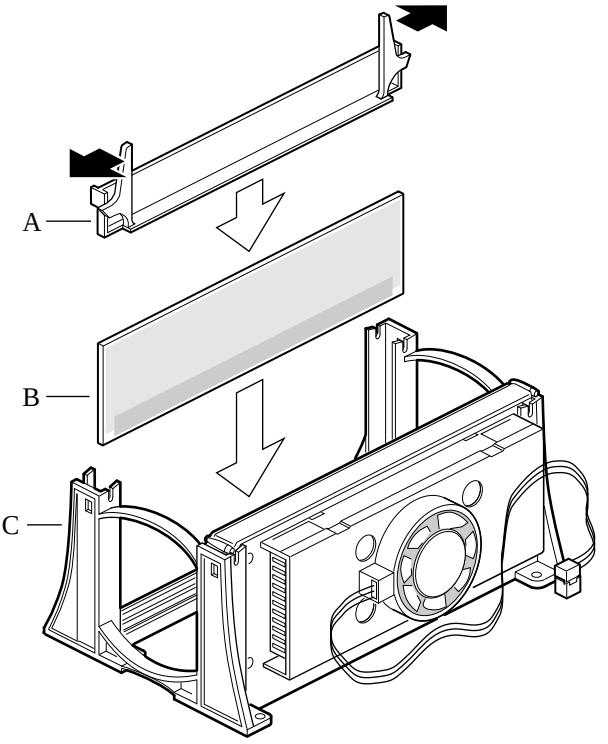
A Processor latches; must be pushed outward until they click into retention mechanism
B Fan heat sink power cable; must plug into processor fan connector on motherboard
C Processor fan connector

6. After you have installed the processor, you must configure its speed. See Chapter 4.

7. To add a second processor, repeat steps 1 through 6. If you plan to have only one processor, you must install a termination board in the empty Slot 1 secondary connector (closest to edge of motherboard).

8. Slide the termination board (B in figure, below) into the retention mechanism. Push down firmly, with even pressure on both sides of the top, until it is seated.
9. Press the tabs on the top of the termination board toward each other. Slide the board into the retention mechanism (C), then push the tabs outward until they click into place (A).

Installing termination board in Slot 1 secondary connector

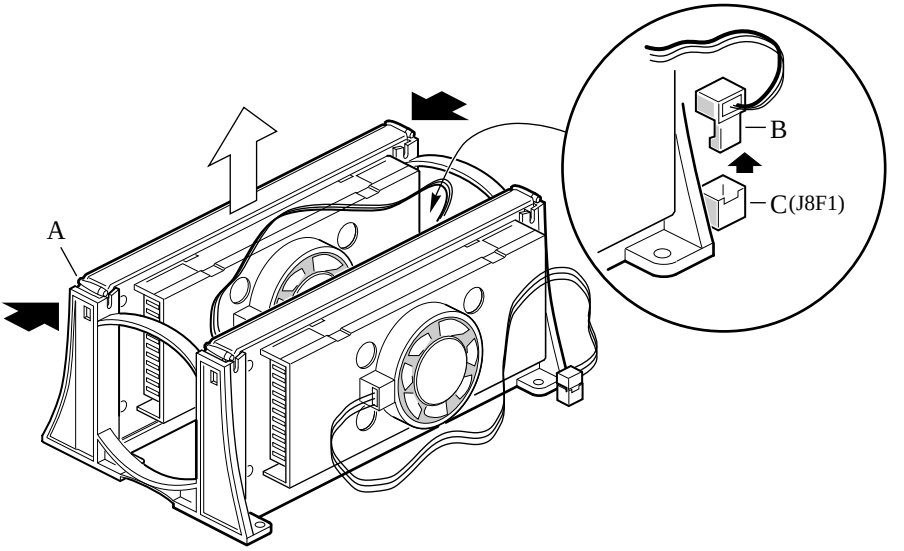


Processor, Removing

CAUTION, ESD and handling processors

Do not touch or bend the processor's exposed pins. Reduce the risk of electrostatic (ESD) discharge damage to the processor by doing the following: (1) Touch the metal chassis before touching the processor or motherboard. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor. (2) Avoid moving around unnecessarily.

1. Observe the safety and ESD precautions at the beginning of this chapter and the additional cautions given here. If the processor has a fan heat sink, disconnect the power wire (B in the figure on page 95) from the connector on the motherboard (C).
2. As you work, place boards and processors on a grounded, static-free surface or conductive foam pad.
3. Press the processor latches (A) toward the center of the S.E.C. cartridge to free them from the retention mechanism.
4. Lift the S.E.C. cartridge upward, out of the retention mechanism.
5. Put the processor in a piece of conductive foam and store in an antistatic package.



OM06345

A Processor latches; must be pushed inward until free from retention mechanism

B Fan heat sink power cable; must be disconnected from processor fan connector on motherboard

C Processor fan connector

□ □ □

Configuring the Motherboard 4

The motherboard has jumper blocks that control various configuration options. This chapter describes the default jumper settings and the options.

Warnings and Cautions

These warnings and cautions apply throughout this chapter. Only a technically qualified person should configure the motherboard.

WARNINGS

System power on/off: If the R440LX motherboard is already installed in a chassis, system power must be turned off. The DC push-button on/off switch on the front panel of most chassis DOES NOT turn off the system AC power. To remove power from system, you must unplug the AC power cord from the wall outlet.

Hazardous conditions, devices & cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cord, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

CAUTIONS

Electrostatic discharge (ESD) & ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you do all procedures in this chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side up on a grounded, static-free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Installing or removing jumpers: A jumper is a small plastic-encased conductor that slips over two jumper pins. Newer jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers, never the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

Tools and Supplies Needed

- Phillips (cross-head) screwdriver (#1 bit and #2 bit)
- Jumper removal tool or needle-nosed pliers
- Pen or pencil
- Antistatic wrist strap and conductive foam pad (recommended)

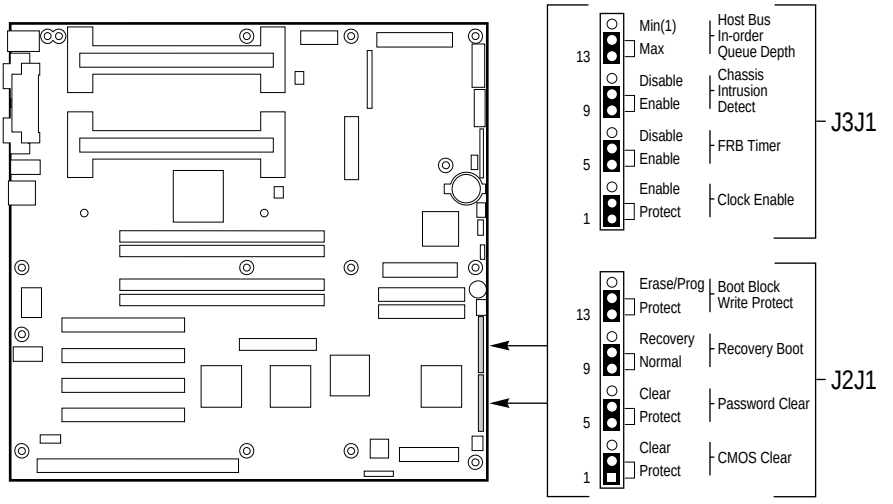
General Procedure to Change Jumper Setting

The short general procedure for changing a configuration setting is the same for most of the jumper functions, so we will describe it here.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. If the motherboard is already installed in a chassis, turn off all connected peripherals, turn off system power, and disconnect the AC power cord.
3. Remove applicable chassis cover(s) to gain appropriate access to the motherboard. You do not need to remove the motherboard from the chassis, and you probably do not need to remove any add-in boards.
4. Locate the configuration jumpers at the edge of the motherboard.
5. Move jumper to pins specified for the desired setting.
6. If applicable, reinstall the chassis cover, connect the power cord, and turn on the system for the change to take effect.
7. You may need to repeat these steps to move the jumper back to its original setting, depending on the jumper function.

Motherboard Jumpers

Two 15-pin single inline headers provide eight 3-pin jumper blocks that control various configuration options, as shown in the figure below. The shaded areas show default jumper placement for each configurable option.



Function	Pins (default in bold)	What it does at system reset
CMOS Clear	**1-2, Protect**	Preserves the contents of NVRAM.
	2-3, Erase	Replaces the contents of NVRAM with the manufacturing default settings.
Password Clear	**5-6, Protect**	Maintains the current system password.
	6-7, Erase	Clears the password.
Recovery Boot	**9-10, Normal**	System attempts to boot using the BIOS stored in flash memory.
	10-11, Recovery	BIOS attempts a recovery boot, loading BIOS code from a floppy diskette into the flash device. This is typically used when the BIOS code has been corrupted.
Boot Block Write Protect	**13-14, Protect**	BIOS boot block is write-protected.
	14-15	BIOS boot block is erasable and programmable. **CAUTION** Programming the boot block incorrectly will prevent the system from booting.
Clock Enable	**1-2, Protect**	Processor speed configuration is protected.
	2-3, Enable	Processor speed is configurable through system BIOS.
FRB Timer Enable	**5-6, Enable**	FRB operation is enabled (system boots from processor 1 if processor 0 fails).
	6-7, Disable	FRB is disabled.
Chassis Intrusion Detection	**9-10, Enable**	Switch installed on chassis indicates when cover has been removed.
	10-11, Disable	Chassis intrusion switch is bypassed.
Host Bus In-order Queue	**13-14, Max**	Host in-order queue depth is set at maximum.
	14-15, Min (1)	Host in-order queue depth is set at 1 (used for debugging).

CMOS Clear Jumper

The jumper at pins 1, 2, and 3 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset.

Procedure to restore the system's CMOS and RTC to default values:

1. See "General Procedure to Change Jumper Setting" on page 99.
2. Move the CMOS jumper from pins 1 and 2 to pins 2 and 3 (the Clear CMOS memory position).
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Turn the system on. Wait for POST to complete and for the messages "NVRAM cleared by jumper" and "Press F2 to enter Setup" to appear. This automatically reprograms CMOS and RTC to their default settings.
5. Enter Setup and make any changes necessary (for example, changing the boot device). Press F10 to save the new Setup configuration and exit Setup.
6. Turn off the system, and disconnect the power cord from the system.
7. Again remove the chassis cover(s).
8. Move the jumper from pins 2 and 3 back to pins 1 and 2 (the Protect CMOS memory position).
9. Reinstall the chassis cover(s), and connect the power cord to the system.
10. Run BIOS Setup or the SCU to verify the correct settings. See Chapter 2.

Password Clear Jumper

The jumper at pins 5, 6, and 7 controls whether a stored password is retained or cleared during a system reset.

Procedure to clear the current password and then enter a new one:

1. See "General Procedure to Change Jumper Setting" on page 99.
2. Move the Password jumper from pins 5 and 6 to pins 6 and 7.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete. This automatically clears the password.
5. Turn off the system, and disconnect the power cord.
6. Again remove the chassis cover(s).

7. Move the jumper from pins 6 and 7 back to pins 5 and 6.
8. Reinstall the chassis cover(s), and connect the power cord to the system.
9. Run the SCU to specify a new password. See Chapter 2.

Recovery Boot Jumper

The jumper at pins 9, 10, and 11 controls whether the system attempts to boot using the BIOS programmed in Flash memory.

Procedure to disable recovery booting:

1. See "General Procedure to Change Jumper Setting" on page 99.
2. Move the recovery boot jumper from pins 9 and 10 to pins 10 and 11.
3. Reinstall the chassis cover(s) for your safety, connect the power cord to the system.
4. Turn the system on, and insert the Flash Memory Update Utility diskette in drive A. After the system boots, the speaker emits a single beep and the recovery process starts. This takes about three minutes. When the recovery process completes, the speaker emits two beeps.

   While in the recovery mode, there is no screen display on the monitor. The keyboard is disabled as the system automatically recovers the BIOS. The following beep codes describe the recovery status.

Beep Code	Message
2	Successful completion, no errors.
4	The system could not boot from the diskette. The diskette may not be bootable.
Continuous series of low beeps	The wrong BIOS recovery files are being used and/or the flash memory jumper is in the wrong position.

5. Turn the system off, disconnect the power cord(s) from the system, and remove the chassis cover(s).
6. Move the jumper from pins 9 and 10 to pins 10 and 11 to enable the normal boot mode.
7. Replace the chassis cover(s), remove the diskette from drive A, and connect the power cord(s) to the system.
8. After running the special recovery mode, run the SCU to specify a new password. See Chapter 2.

Boot Block Write Protect Jumper

The jumper at pins 13, 14, and 15 controls whether the BIOS boot block is protected from being erased and reprogrammed.

CAUTION, leave boot block jumper at factory-default setting
Programming the boot block incorrectly will prevent the system from booting. Programming *should only be done* by a technically qualified person. The procedure requires a special "Boot Block Update Utility." Contact your dealer or sales representative for more information.

Procedure to permit boot block erasing and programming:

1. See "General Procedure to Change Jumper Setting" on page 99.
2. Move the boot block jumper from pins 13 and 14 to pins 14 and 15 to erase and program the BIOS boot block.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Run the Boot Block Update Utility.
5. Turn off the system, and disconnect the power cord from the system.
6. Remove the chassis cover(s).
7. Move the jumper from pins 14 and 15 back to pins 13 and 14 to write protect the BIOS boot block.
8. Reinstall the chassis cover(s), and connect the power cord to the system.

Clock Enable Jumper

The jumper at pins 1, 2, and 3 allows you to configure the speed of the processor.

Procedure to enable processor speed configuration:

1. See "General Procedure to Change Jumper Setting" on page 99.
2. Move the processor speed jumper from pins 1 and 2 to pins 2 and 3. This activates the CPU Speed Setting field in the BIOS Setup Utility.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Run the BIOS Setup Utility as described in Chapter 2.
5. Select the proper speed for your processor.
6. Again remove the chassis cover(s).
7. Move the processor speed jumper from pins 2-3 back to pins 1-2.
8. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.

FRB Timer Enable Jumper

The jumper at pins 5, 6, and 7 controls whether the system boots from processor 1 if processor 0 fails.

Procedure to disable FRB timer:

1. See “General Procedure to Change Jumper Setting” on page 99.
2. Move the recovery boot jumper from pins 5 and 6 to pins 6 and 7.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to comlpete.
5. Run the SCU to configure the system. See Chapter 2.

Chassis Intrusion Detection Jumper

Your chassis may contain an alarm switch that sends a notification signal to the server management software if a cover is removed. See your chassis documentation or contact your chassis vendor to determine whether your chassis has this feature The jumper at pins 9, 10, and 11 controls whether this alarm feature is enabled or disabled.

Procedure to disable (bypass) the chassis intrusion switch:

1. See “General Procedure to Change Jumper Setting” on page 99.
2. Move the chassis intrusion detection jumper from pins 9 and 10 to pins 10 and 11 to disable the alarm switch.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete.
5. Run the SCU to configure the system. See Chapter 2.

To enable the intrusion switch, do the above steps but move the jumper back to pins 9 and 10.

Host Bus In-order Queue Jumper

The jumper at pins 13, 14, and 15 controls whether the host bus in-order queue is set at maximum or minimum (one).

Procedure to change setting of the host bus in-order queue from maximum to minimum (one):

1. See “General Procedure to Change Jumper Setting” on page 99.
2. Move the host bus in-order queue jumper from pins 13 and 14 to pins 14 and 15 to disable the alarm switch.
3. Reinstall the chassis cover(s) for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete.
5. Run the SCU to configure the system. See Chapter 2.

To change the setting to maximum, do the above steps but move the jumper back to pins 13 and 14.

□ □ □

5 Updating Flash Memory

System BIOS

The system BIOS is stored in nonvolatile memory (NVRAM) in a flash EPROM device. You can easily update the BIOS without replacing the device. This chapter describes two procedures:

- Update the BIOS, normal procedure: you do not need to open the system. A BIOS update always updates Setup, the onboard Video BIOS, and the SCSI BIOS.
- Recover the BIOS when an interruption has occurred during an update: in this case, you will need to change a jumper on the motherboard, do the recovery procedure, and then change the jumper back. The recovery procedure updates only the main system BIOS.

Flash in your custom language files again
Language files will be overwritten by a BIOS update or recovery. If a custom language file has been created for your system, you must flash in your custom file again after updating the BIOS. The user binary area is untouched by a system BIOS update.

Make sure you have a backup copy
It is always a good idea to have a backup copy of your system before installing any new software.

Contents of BIOS Update

A new BIOS is contained in .BIx files. The number of files is determined by the size of the BIOS area in the flash part. The system BIOS files are named as follows:

xxxxxxxx.BIO
xxxxxxxx.BI1
xxxxxxxx.BI2
....

Filename restrictions
The first eight letters of the filename can be anything but cannot be renamed. Each file contains a link to the next file in the sequence. FMUP does a link check before updating to ensure that the FMUP process will be successful. The first file in the list can be renamed to any filename, but all subsequent filenames must remain unchanged.

User Flash Block

One 8 KB user block is available for general use, and Flash Memory Update Utility (FMUP) can update this area with user-supplied code or data. This area may optionally be scanned for adapter BIOS signatures during POST, and any BIOS found there will be initialized in the same manner as any other adapter BIOS. To enable or disable this scanning process, use an option in the SCU and in Setup. Some system resources (e.g., RAM, CMOS) may be required by the scanned BIOSes.

To accommodate a range of uses, the user flash area will allow user programs to be called at various points in the BIOS execution.

A custom BIOS placed in flash must be recognizable to the system BIOS so it can execute the code, and to applications (i.e., DOS memory managers) so that they will be protected after DOS boots.

Normal BIOS Update Procedure

1. Get a BIOS update from your customer sales representative or dealer, and copy the file to a bootable DOS diskette. You do not need to open the system or remove add-in boards for a normal BIOS update.
2. Insert the update diskette in drive A.
3. Reboot the system. The update process starts automatically following system boot. Follow the displayed prompts, including a final reboot.

Updating the BIOS does not clear CMOS. If you need to clear CMOS and reset nonvolatile memory to the factory defaults, see Chapter 4.

Recovery Procedure

A special program, the Flash Memory Update Utility (FMUP), must be used to recover the BIOS. For a copy of the utility, contact your customer service representative.

Recovery may be needed in the case of a corrupt .BIx image or an unsuccessful BIOS update. For example, you might be doing a normal update to flash memory and the procedure gets interrupted because of a power outage. Flash memory contains a protected area that cannot be corrupted, and therefore code in this area can be used to boot the system from drive A even though the BIOS has been corrupted. The recovery code boots DOS from drive A and executes the special AUTOEXEC.BAT file released with the BIOS version. The batch file invokes FMUP to recover the system BIOS from files on the diskette.

You can use FMUP to:

- Save: Take a mirror image copy of a given flash area and copy it to a file or files on hard disk or diskette.
- Update: Take a file or files from hard disk or diskette and update them in the system's flash device.
- Verify: Compare an existing flash area against a file or files on hard disk or diskette to verify that the versions are the same and insure that the system has the correct BIOS version.

WARNINGS
All Warnings and Cautions given at the beginning of Chapter 4 apply here.

Before beginning recovery procedure
If you have mapped the BIOS of an add-in board to any part of the E0000H address range, you must either map it to another area before beginning a recovery procedure or physically remove the board from the system.

Exit Windows and disable EMM386 before using FMUP
FMUP must be run without the presence of a 386 control program (such as Windows or EMM386). FMUP uses the processor's flat model mode to update the flash part.

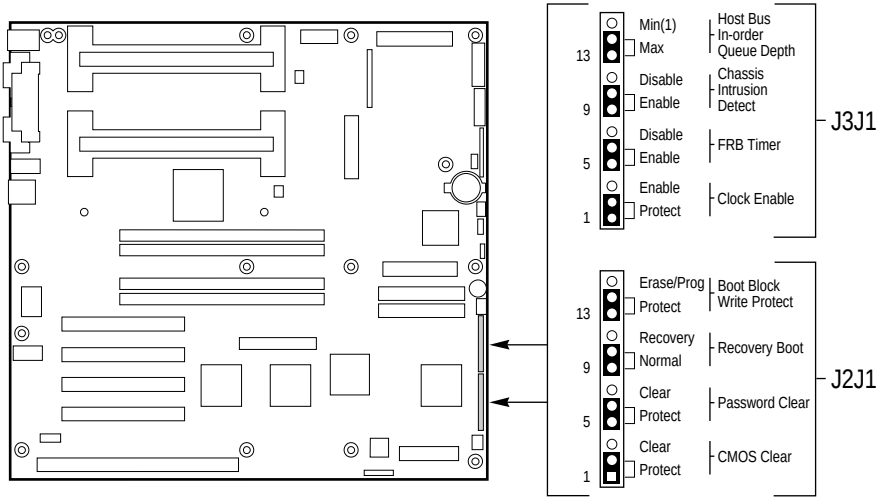
Recovery updates only the main system BIOS. Video is not initialized, and the keyboard is disabled. Because there is no screen display, you will need to listen for these audible beep codes:

Recovery beep codes	Description
1	Signals beginning of recovery process; process takes 2 to 4 minutes.
2	Signals successful completion, no errors.
4	System could not boot from the diskette. Diskette may not be bootable.
Continuous series of low beeps (like a buzz)	Any or all of these causes: The wrong BIOS recovery files are being used. The boot option configuration jumper allowing BIOS Recovery mode is in wrong position. One or more system BIOS FMUP files is corrupt or missing.

Requirements:

- At least 4 MB of RAM installed.
- Drive A must be a 3.5-inch 1.44 MB diskette drive.

1. If you have not already done so, create a bootable DOS diskette, and copy the BIOS update to the diskette.
2. Observe the safety and ESD precautions **at the beginning of Chapter 4.**
3. If the motherboard is already installed in a chassis, turn off all connected peripherals, turn off system power, and disconnect the AC power cord.
4. Remove applicable chassis cover(s) to gain appropriate access to the motherboard. You do not need to remove the motherboard from the chassis, and you probably do not need to remove any add-in boards.
5. Locate the configuration jumper header on the motherboard.
6. Move the Recovery Boot jumper at J2J1 from pins 9 and 10 **to pins 10 and 11**.
7. Reinstall the chassis cover(s), and connect the power cord to the system.
8. Insert the Flash Memory Update Utility (FMUP) diskette in drive A. Turn the system on. You will hear a single initial beep that is part of the typical system bootup process.



OM06428a

9. Then you will hear another single beep that indicates the recovery process is beginning. The process takes two to four minutes. While in the recovery mode, there is no screen display on the monitor, and the keyboard is disabled as the system automatically recovers the BIOS.
10. You will hear two beeps when the process is successfully completed. (If the process is not successful, you will hear a different beep pattern; refer to the table on page 110.)
11. Make sure the diskette drive activity is OFF. Turn off the system, and disconnect the power cord from the system.
12. Again remove the chassis cover(s).
13. Remove the Recovery Boot jumper from pins 10 and 11, and place it back on **pins 9 and 10** for the normal boot mode.
14. Remove the FMUP diskette from drive A.
15. Reinstall the chassis cover(s), connect the power cord, and turn on the system. Check the BIOS version number against what you intended to flash into memory.
16. Run the SCU to check or modify the configuration. See Chapter 2.

CMOS is not cleared when you update the BIOS. After doing the recovery procedure, clear CMOS (see procedure in Chapter 4, section “CMOS Clear Jumper”). Also, you will need to flash in again any additional languages that were present before updating.

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Hardware Technical Reference 6

This chapter includes the following:

- Environmental specifications
- System memory map addresses
- Board interrupts
- Motherboard connectors
- Front panel control board connectors
- Standard video modes
- Electromagnetic Compatibility (EMC) notices

Terms and Abbreviations

The following terms and abbreviations are used in the connector pinout tables:

- Signal active low: Either a pound sign (#) following a signal name or an "_L" symbol following the name indicates that the signal is active in the low state (for example, HD1_ACTIVE# or P_REQ_SLOT0_L).
- NC = Not connected. This also appears spelled out.
- GND = Ground.

Motherboard Environmental Specifications

Temperature			
Nonoperating	–40° to 70 °C (–40° to 158 °F)		
Operating	0° to 55 °C (32° to 131 °F) with adequate air flow		
Shock			
Unpackaged	50 g, trapezoidal waveform, velocity change: 170 inches/sec		
Packaged	Half sine 2 millisecond		
	Product Weight	Free Fall Height (inches)	Velocity Change (inches/sec)
	<20 lb.	36	167
	21-40	30	152
	41-80	24	136
	81-100	18	118
Vibration			
Unpackaged	5 Hz to 20 Hz	$0.01g^2$ Hz sloping up to 0.02 g^2 Hz	
	20 Hz to 500 Hz	0.02 g^2 Hz (flat)	
Packaged	10 Hz to 40 Hz	$0.015g^2$ Hz (flat)	
	40 Hz to 500 Hz	0.015 g^2 Hz sloping down to .00015g^2 Hz	
DC Voltage	+ 5V	± 5%	
	- 5V	± 5%	
	+ 12V	± 5%	
	- 12V	± 5%	
	3.3V if available	± 5%	

System I/O Addresses

The following table shows the location in I/O space of all directly I/O-accessible registers

Address(es)	Resource	Device	Notes
0000h - 000Fh	DMA Controller 1	PIIX4	
0010h - 001Fh	DMA Controller 1	PIIX4	Aliased from 0000h - 000Fh
0020h - 0021h	Interrupt Controller 1	PIIX4	
0022h - 0023h			
0024h - 0025h	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
0026h - 0027h			
0028h - 0029h	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
002Ah - 002Bh			
002Ch - 002Dh	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
002Eh - 002Fh	Super I/O Index and Data Ports		
0030h - 0031h	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
0032h - 0033h			
0034h - 0035h	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
0036h - 0037h			
0038h - 0039h	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
003Ah - 003Bh			
003Ch - 003Dh	Interrupt Controller 1	PIIX4	Aliased from 0020h - 0021h
003Eh - 003Fh			

Continued

Address(es)	Resource	Device	Notes
0040h - 0043h	Programmable Timers	PIIX4	
0044h - 004Fh			
0050h - 0053h	Programmable Timers	PIIX4	Aliased from 0040h - 0043h
0054h - 005Fh			
0060h, 0064h	Keyboard Controller		Keyboard chip select from 87307
0061h	NMI Status & Control Register	PIIX4	
0063h	NMI Status & Control Register	PIIX4	Aliased
0065h	NMI Status & Control Register	PIIX4	Aliased
0067h	NMI Status & Control Register	PIIX4	Aliased
0070h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4	
0072h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4	Aliased from 0070h
0074h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4	Aliased from 0070h
0076h	NMI Mask (bit 7) & RTC Address (bits 6::0)	PIIX4	Aliased from 0070h
0071h	RTC Data	PIIX4	
0073h	RTC Data	PIIX4	Aliased from 0071h
0075h	RTC Data	PIIX4	Aliased from 0071h
0077h	RTC Data	PIIX4	Aliased from 0071h

Continued

Address(es)	Resource	Device	Notes
0080h - 0081h	BIOS Timer		
0080h - 008Fh	DMA Low Page Register	PIIX4	
0090h - 0091h	DMA Low Page Register (aliased)	PIIX4	
0092h	System Control Port A (PC-AT control Port) (this port not aliased in DMA range)	PIIX4	
0093h - 009Fh	DMA Low Page Register (aliased)	PIIX4	
0094h	Video Display Controller		
00A0h - 00A1h	Interrupt Controller 2	PIIX4	
00A4h - 00A15	Interrupt Controller 2 (aliased)	PIIX4	
00A8h - 00A19	Interrupt Controller 2 (aliased)	PIIX4	
00ACh - 00ADh	Interrupt Controller 2 (aliased)	PIIX4	
00B0h - 00B1h	Interrupt Controller 2 (aliased)	PIIX4	
00B2h	Advanced Power Management Control	PIIX4	
00B3h	Advanced Power Management Status	PIIX4	
00B4h - 00B5h	Interrupt Controller 2 (aliased)	PIIX4	
00B8h - 00B9h	Interrupt Controller 2 (aliased)	PIIX4	

Continued

Address(es)	Resource	Device	Notes
00BCh - 00BDh	Interrupt Controller 2 (aliased)	PIIX4	
00C0h - 00DFh	DMA Controller 2	PIIX4	
00F0h	Clear NPX error	Resets IRQ13	
00F8h - 00FFh	x87 Numeric Coprocessor		
0102h	Video Display Controller		
0170h - 0177h	Secondary Fixed Disk Controller (IDE)	PIIX4 (not used)	
01F0h - 01F7h	Primary Fixed Disk Controller (IDE)	PIIX4	
0200h - 0207h	Game I/O Port	Not used	
0220h - 022Fh	Serial Port A		
0238h - 023Fh	Serial Port B		
0278h - 027Fh	Parallel Port 3		
02E8h - 02EFh	Serial Port B		
02F8h - 02FFh	Serial Port B		
0338h - 033Fh	Serial Port B		
0370h - 0375h	Secondary Diskette		
0376h	Secondary IDE		
0377h	Secondary IDE/Diskette		
0378h - 037Fh	Parallel Port 2		
03B4h - 03BAh	Monochrome Display Port		

Continued

Address(es)	Resource	Device	Notes
03BCh - 03BFh	Parallel Port 1 (Primary)		
03C0h - 03CFh	Video Display Controller		
03D4h - 03DAh	Color Graphics Controller		
03E8h - 03EFh	Serial Port A		
03F0h - 03F5h	Diskette Controller		
03F6h - 03F7h	Primary IDE - Sec. Diskette		
03F8h - 03FFh	Serial Port A (Primary)		
0400h - 043Fh	DMA Controller 1, Extended Mode Registers	PIIX4	
0461h	Extended NMI / Reset Control	PIIX4	
0462h	Software NMI	PIIX4	
0480h - 048Fh	DMA High Page Register	PIIX4	
04C0h - 04CFh	DMA Controller 2, High Base Register		
04D0h - 04D1h	Interrupt Controllers 1 and 2 Control Register		
04D4h - 04D7h	DMA Controller 2, Extended Mode Register		
04D8h - 04DFh	Reserved		
04E0h - 04FFh	DMA Channel Stop Registers		
0678h - 067Ah	Parallel Port (ECP)		
0778h - 077Ah	Parallel Port (ECP)		
07BCh - 07BEh	Parallel Port (ECP)		
0800h - 08FFh	NVRAM		

Continued

Address(es)	Resource	Device	Notes
0C80h - 0C83h	EISA System Identifier Registers	PIIX4	
0C84h	Board Revision Register		
0C85h - 0C86h	BIOS Function Control		
0CA9h	DISMIC Data Register	Server management mailbox	
0CAAh	DISMIC Control/Status Register	registers	
0CABh	DISMIC Flags Register		
0CF8h	PCI CONFIG_ADDRESS Register	Located in PAC	
0CF9h	PAC Turbo and Reset control	PIIX4	
0CFCh	PCI CONFIG_DATA Register	Located in PAC	
46E8h	Video Display Controller		
xx00 - xx1F*	SCSI registers	Refer to SCSI chip doc	

* SCSI I/O base address is set using configuration registers.

DOS Compatibility Region

The DOS compatibility region covers 1 MB of memory from addresses 0000_0000h to 0FFFFF.

Address Range (hex)	Amount	Function
0 to 07FFFFh	512 KB	DOS region, base system memory (fiXEd)
080000h to 09FFFFh	128 KB	ISA window memory
0A0000h to 0BFFFFh	128 KB	Video or SMM memory
0C0000h and 0DFFFFh	128 KB	Add-in board BIOS and buffer area
0E0000h to 0EFFFFh	64 KB	Extended system BIOS
0F0000h to 0FFFFFh	64 KB	System BIOS

Extended Memory Region

The Extended Memory region covers 4 GB of address space from addresses 0100000h to FFFFFFFFh.

Address Range (hex)	Amount	Function
100000h to 3FFF_FFFFh	1 GB	Local DRAM space
FEC00000h to FFFFFFFFh	3 GB	PCI memory space

Interrupts

The table below recommends the logical interrupt mapping of interrupt sources; it reflects a typical configuration, but these interrupts can be changed by the user. Use the information to determine how to program each interrupt. The actual interrupt map is defined using configuration registers in the PIIX4 and the I/O controller. I/O Redirection Registers in the I/O APIC are provided for each interrupt signal; the signals define hardware interrupt signal characteristics for APIC messages sent to local APIC(s).

To disable either IDE controller and reuse the interrupt
If you plan to disable either IDE controller to reuse the interrupt for that controller, you must physically unplug the IDE cable from the board connector (IDE0 or IDE1) if a cable is present. Simply disabling the drive by configuring the SCU option does not free up the interrupt.

Interrupt	I/O APIC level	Description
INTR	INT0	Processor interrupt
NMI	N/A	NMI from DISMIC to processor
IRQ1	INT1	Keyboard interrupt
Cascade	INT2	Interrupt signal from second 8259 in PIIX4
IRQ3	INT3	Serial port A or B interrupt from 87307VUL device (user can configure)
IRQ4	INT4	Serial port A or B interrupt from 87307VUL device (user can configure)
IRQ5	INT5	Parallel port
IRQ6	INT6	Diskette
IRQ7	INT7	Parallel port
IRQ8_L	INT8	RTC interrupt
IRQ9	INT9	Available (can be used by ISA bus)

Continued

Interrupt	I/O APIC level	Description
IRQ10	INT10	Open for use
IRQ11	INT11	Open for use
IRQ12	INT12	Mouse interrupt
N/A	INT13	Used by floating point unit (FPU) and is NOT AVAILABLE
IRQ14	INT14	Compatibility IDE interrupt from primary channel IDE devices 0 and 1
IRQ15	INT15	Open for use
P_INTA_L	INT16	PCI Interrupt signal A
P_INTB_L	INT17	PCI Interrupt signal B
P_INTC_L	INT18	PCI Interrupt signal C
P_INTD_L	INT19	PCI Interrupt signal D
SMI_L	N/A	System management interrupt—general purpose error indicator from a control PAL that provides an SMI_L from non-traditional error sources (PERR_L, SERR_L, and others)

Video Modes

The 5446 integrated video controller provides all standard IBM VGA modes. With 1 MB of video memory, the system goes beyond standard VGA support. The tables below show all supported video modes using 1 MB of video memory. The following tables show the standard modes that the chip supports, including the number of colors and palette size, resolution, pixel frequency, and scan frequencies.

Standard VGA Modes

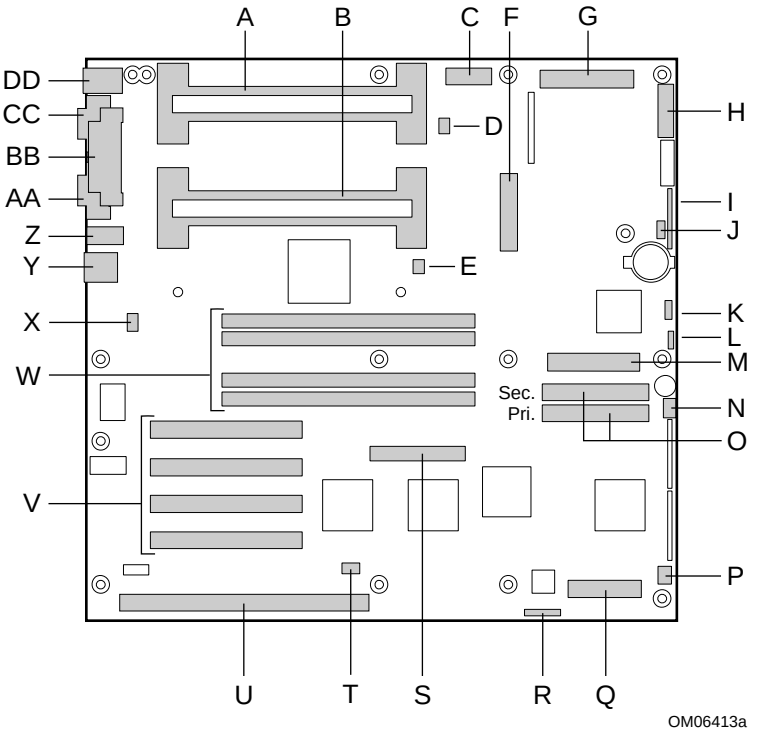
Mode(s) in Hex	Bits Per Pixel	Colors (no. per palette size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)
0, 1	4	16/256K	360 X 400	14	31.5	70
2, 3	4	16/256K	720 X 400	28	31.5	70
4, 5	4	4/256K	320 X 200	12.5	31.5	70
6	4	2/256K	640 X 200	25	31.5	70
7	4	Mono	720 X 400	28	31.5	70
D	4	16/256K	320 X 200	12.5	31.5	70
E	4	16/256K	640 X 200	25	31.5	70
F	4	Mono	640 X 350	25	31.5	70
10	4	16/256K	640 X 350	25	31.5	70
11	4	2/256K	640 X 480	25	31.5	60
12	4	16/256K	640 X 480	25	31.5	60
12+	4	16/256K	640 X 480	31.5	37.5	75
13	8	256/256K	320 X 200	12.5	31.5	70

Extended VGA Modes

Mode(s) in Hex	Bits per pixel	Colors (no per palette size)	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)
14, 55	8	16/256K	1056 X 400	41.5	31.5	70
54	8	16/256K	1056 X 350	41.5	31.5	70
58, 6A	8	16/256K	800 X 600	40	37.8	60
58, 6A	8	16/256K	800 X 600	49.5	46.9	75
5C	8	256/256K	800 X 600	36	35.2	56
5C	8	256/256K	800 X 600	40	37.9	60
5C	8	256/256K	800 X 600	49.5	46.9	75
5D	8	16/256K (interlaced)	1024 X 768	44.9	35.5	87
5D	8	16/256K	1024 X 768	65	48.3	60
5D	8	16/256K	1024 X 768	75	56	70
5D	8	16/256K	1024 X 768	78.7	60	75
5F	8	256/256K	640 X 480	25	31.5	60
5F	8	256/256K	640 X 480	31.5	37.5	75
60	8	256/256K (interlaced)	1024 X 768	44.9	35.5	87
60	8	256/256K	1024 X 768	65	48.3	60
60	8	256/256K	1024 X 768	75	56	70
60	8	256/256K	1024 X 768	78.7	60	75
64	16	64K	640 X 480	25	31.5	60
64	16	64K	640 X 480	31.5	37.5	75
65	16	64K	800 X 600	36	35.2	56
65	16	64K	800 X 600	40	37.8	60
65	16	64K	800 X 600	49.5	46.9	75
66	16	32K Direct/256 Mixed	640 X 480	25	31.5	60
66	16	32K Direct/256 Mixed	640 X 480	31.5	37.5	75
67	16	32K Direct/256 Mixed	800 X 600	40	37.8	60
67	16	32K Direct/256 Mixed	800 X 600	49.5	46.9	75
6C	16	16/256K (interlaced)	1280 X 1024	75	48	87

Connectors

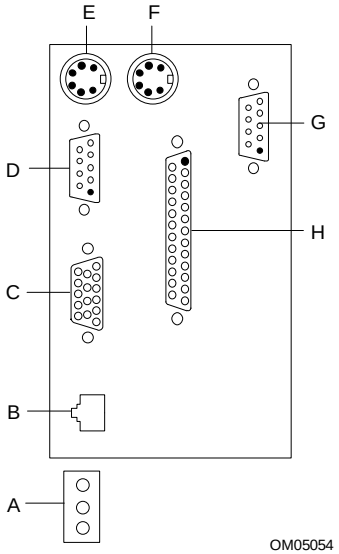
The figure shows connector locations on the motherboard. This section provides pin information about the connectors.



A	Slot 1 secondary connector
B	Slot 1 primary connector
C	Auxiliary power connector, 14 pin
D	Fan heat sink secondary connector
E	Fan heat sink primary connector
F	ATX power connector, 20 pin
G	Main power connector (from power supply), 24 pin
H	Front panel connector, 16 pin
I	AT front panel connector
J	Local IMB connector
K	System management bus connector
L	External speaker connector
M	Diskette drive connector
N	System fan 1 connector
O	IDE connectors, primary (labeled IDE1) and secondary (labeled IDE2)
P	System fan 2 connector
Q	Server monitor module (SMM) connector
R	ISP connector
S	Wide SCSI connector
T	Hard drive LED connector
U	ISA slot for add-in board (one)
V	PCI slots for add-in boards (four); slot 1 is closest to ISA slot
W	Memory sockets for four DIMM components; socket 4 is closest to PCI slots
X	Chassis intrusion switch connector
Y	RJ-45 network controller*
Z	Serial port B (COM 2) *
AA	VGA monitor port*
BB	Parallel port*
CC	Serial A (COM 1) *
DD	Keyboard and Mouse PS/2 compatible connectors (interchangeable) *

* See “Back Panel Connectors” on page 128.

Back Panel Connectors



A Network controller LEDs
- Activity (top)
- Link (middle)
- Speed (bottom)

B RJ-45 network connector port

C VGA, 15-pin video connector

D Serial port A, 9-pin connector (COM1)

E PS/2-compatible keyboard port, 6-pin miniature Deutsche Industrie Norm (DIN) connector (interchangeable with mouse port)

F PS/2-compatible mouse port, 6-pin DIN connector (interchangeable with keyboard port)

G Serial port B, 9-pin connector (COM2)

H Parallel port (LPT1), 25-pin connector

ATX Power

Pin	Signal	Wire color	Pin	Signal	Wire color
1	+3.3 VDC	Orange	11	+3.3 VDC	Orange
				3.3 V sense	Brown
2	+3.3 VDC	Orange	12	-12 VDC	Blue
3	COM	Black	13	COM	Black
4	+5 VDC	Red	14	PS-ON #	Green
5	COM	Black	15	COM	Black
6	+5 VDC	Red	16	COM	Black
7	COM	Black	17	COM	Black
8	PWR-OK	Grey	18	-5 VDC	White
9	5 VSB	Purple	19	+5 VDC	Red
10	+12 VDC	Yellow	20	+5 VDC	Red

Main Power

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	+5 VDC	Red	7	COM	Black
13	+5 VDC	Red	19	COM	Black
2	+5 VDC	Red	8	COM	Black
14	+5 VDC	Red	20	COM	Black
3	-5 VDC	White	9	COM	Black
15	+5 VDC	Red	21	COM	Black
4	-12 VDC	Blue	10	+3.3 VDC	Orange
16	+5 VDC	Red	22	+3.3 VDC	Orange
5	COM	Black	11	+12V	Yellow
17	COM	Black	23	+3.3 VDC	Orange
6	COM	Black	12	+12 VDC	Yellow
18	COM	Black	24	+12 VDC	Yellow

Auxiliary Power (non-ATX Connector)

Pin	Signal	Wire color
1	5V Remote sense return	Black
2	5 V remote sense	Red
3	3.3 V remote sense	Orange
4	3.3V remote sense return	Black
5	Not connected	none
6	Not connected	none
7	GND	Black
8	POWER_GOOD	Gray
9	PS_ON	Green
10	COM *	Black
11	5 VSB	Purple
12	Key	None
13	Not connected	None
14	COM	Black

Peripheral Power Connectors

Pin	Description
1	+12 VDC
2 and 3	GND
4	+5.1 VDC

Diskette Drive

Pin	Signal	Pin	Signal
1	GND	18	FD_DIR_L
2	FD_DENSEL	19	GND
3	GND	20	FD_STEP_L
4	N/C	21	GND
5	Key	22	FD_WDATA_L
6	FD_DRATE0	23	GND
7	GND	24	FD_WGATE_L
8	FD_INDEX_L	25	GND
9	GND	26	FD_TRK0_L
10	FD_MTR0_L	27	FD_MSEN0
11	GND	28	FD_WPROT_L
12	FD_DR1_L	29	GND
13	GND	30	FD_RDATA_L
14	FD_DR0_L	31	GND
15	GND	32	FD_HDSEL_L
16	FD_MTR1_L	33	GND
17	FD_MSEN1	34	FD_DSKCHG_L

Hard Disk Drive Activity LED

Pin	Signal
1	Return
2	Hard disk active
3	Hard disk active
4	Return

Front Panel Connector

Pin	Signal	Pin	Signal
1	GND	2	Hard disk activity LED
3	Front panel reset switch	4	Front panel power switch
5	+5V	6	N/C (key)
7	Front panel NMI switch	8	+5V
9	Fan failure indicator LED	10	Chassis intrusion switch
11	Power fault LED	12	+5V standby
13	IMB Data line	14	GND
15	IMB Clock line	16	GND

Fan Interface

The motherboard has four 3-pin, shrouded, and keyed fan connectors. Two are located next to the processor sockets (one for each processor) for a tachometer fan heat sink. The remaining two fan connectors attach to fans equipped with a sensor that indicates whether the fan is operating. The sensor pins for these fans are routed to the BMC for failure monitoring. Each connector has the following pinout:

Pin	Signal
1	GND
2	Fan Sensor
3	+12V

The fan heat sink connector has the following pinout:

Pin	Signal
1	GND
2	+12V
3	Fan Sensor

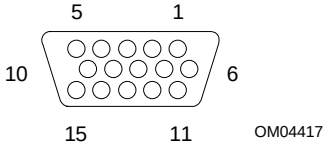
Server Management

Pin	Signal	Description
1	CPU_SMI_L	System Management Interrupt
2	LOCAL_I2C_SCL	IMB clock line
3	GND	Ground
4	Reserved	N/A
5	PWR_CNTRL_SFC_L	Host power supply on/off control
6	LOCAL_I2C_SDA	IMB serial data line
7	5VSTNDBY	+5V standby indication (power OK)
8	KEYLOCK_SFC_L	Keyboard lock signal
9	CPU_NMI	Non-maskable interrupt indication
10	VCC3	3.3V power supply status input
11	RST_SFC_L	Motherboard reset signal from Server Monitor Module
12	GND	Ground
13	GND	Ground
14	Reserved	N/A
15	SECURE_MODE_BMC	Secure mode indication
16	GND	Ground
17	SFC_CHASSIS_INSTRUSION_L	Chassis intrusion indication
18	Reserved	N/A
19	Reserved	N/A
20	GND	Ground
21	Reserved	N/A
22	Reserved	N/A
23	Reserved	Not used
24	Reserved	N/A
25	Key pin (N/C)	Connector key
26	Reserved	N/A

IMB

Pin	Signal
1	LOCAL_I2C_SCL
2	GND
3	LOCAL_I2C_SDA

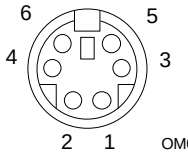
VGA Video Port



Pin	Signal
1	Red
2	Green
3	Blue
4	Not connected
5	Video GND (shield)
6	Video GND (shield)
7	Video GND (shield)
8	Video GND (shield)

Pin	Signal
9	Not connected
10	GND (video ground)
11	Not connected
12	DDCDAT (monitor ID data)
13	HSYNC (horizontal synchronization)
14	VSYNC (vertical synchronization)
15	DDCCLK (monitor ID clock)

Keyboard and Mouse

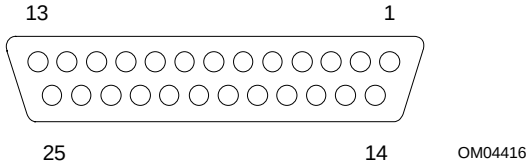


These PS/2-compatible connectors share a common housing; they are functionally equivalent.

Pin	Keyboard signal
1	KEYDAT (keyboard data)
2	Not connected
3	GND
4	FUSED_VCC (+5 V)
5	KEYCLK (keyboard clock)
6	Not connected

Pin	Mouse signal
1	MSEDAT (mouse data)
2	Not connected
3	GND
4	FUSED_VCC (+5 V)
5	MSECLK (mouse clock)
6	Not connected

Parallel Port

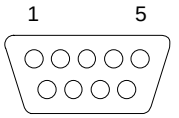


The IEEE 1284-compatible parallel port, used primarily for a printer, sends data in parallel format.

Pin	Signal
1	STROBE_L
2	Data bit 0
3	Data bit 1
4	Data bit 2
5	Data bit 3
6	Data bit 4
7	Data bit 5
8	Data bit 6
9	Data bit 7

Pin	Signal
10	ACK_L (acknowledge)
11	Busy
12	PE (paper end)
13	SLCT (select)
14	AUFDXT (auto feed) #
15	ERROR_L
16	INIT_L (initialize printer)
17	SLCTIN_L (select input) #
18–25	GND

Serial Ports A and B



These ports support external devices such as modems and scanners that require serial data transmission.

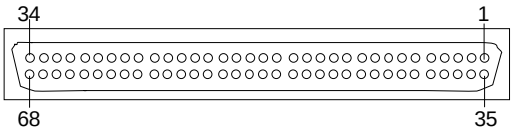
Pin	Serial Port A Signal
1	DCD (data carrier detect)
2	RXD (receive data)
3	TXD (transmit data)
4	DTR (data terminal ready)
5	GND
6	DSR (data set ready)
7	RTS (request to send)
8	CTS (clear to send)
9	RIA (ring indicator)

Pin	Serial Port B Signal
1	DCD (data carrier detect)
2	DSR (data set ready)
3	RXD (receive data)
4	RTS (request to send)
5	TXD (transmit data)
6	CTS (clear to send)
7	DTR (data terminal ready)
8	RIA (ring indication active)
9	GND

RJ-45 Network

Pin	Signal	Description
1	TX+	Transmit data plus—the positive signal for the TD differential pair contains the serial output data stream transmitted onto the network
2	TX-	Transmit data minus—the negative signal for the TD differential pair contains the same output as pin 1
3	RX+	Receive data plus—the positive signal for the RD differential pair contains the serial input data stream received from the network
4	No connection	
5	No connection	
6	RX-	Receive data minus—the negative signal for the RD differential pair contains the same input as pin 3
7	No connection	
8	No connection	

68-Pin Wide/Fast 16-Bit SCSI



Pin	Signal	Pin	Signal
1–16	GND	49–50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	RESERVED	53	RESERVED
20–34	GND	54	GND
35	DB 12_L	55	ATN_L
36	DB 13_L	56	GND
37	DB 14_L	57	BSY_L
38	DB 15_L	58	ACK_L
39	DB P1_L	59	RST_L
40	DB 0_L	60	MSG_L
41	DB 1_L	61	SEL_L
42	DB 2_L	62	CD_L
43	DB 3_L	63	REQ_L
44	DB 4_L	64	I/O_L
45	DB 5_L	65	DB 8_L
46	DB 6_L	66	DB 9_L
47	DB 7_L	67	DB 10_L
48	DB P_L	68	DB 11_L

IDE

Pin	Signal	Pin	Signal
1	RESET_L	21	IDEDRQ
2	GND	22	GND
3	DD7	23	DIOW_L
4	DD8	24	GND
5	DD6	25	DIOR_L
6	DD9	26	GND
7	DD5	27	IORDY
8	DD10	28	CSEL (1 KΩ p/d)
9	DD4	29	IDEDAK_L
10	DD11	30	GND
11	DD3	31	IDEIRQ
12	DD12	32	Reserved (N/C)
13	DD2	33	IDESA1
14	DD13	34	PDIAG_L (tied to GND)
15	DD1	35	IDESA0
16	DD14	36	IDESA2
17	DD0	37	IDECS1_L
18	DD15	38	IDECS3_L
19	GND	39	IDEHDACT_L
20	Keyed	40	GND

If no IDE drives are present, there should be no IDE cable connected. If only IDE one drive is installed, it must be connected at the end of the cable.

ISA

The motherboard ISA connectors follow the standard pinout given in the ISA Specification.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	IOCHK_L	B1	GND	A26	SA5	B26	DACK2_L
A2	SD7	B2	RESET	A27	SA4	B27	TC
A3	SD6	B3	+5V	A28	SA3	B28	BALE
A4	SD5	B4	IRQ9	A29	SA2	B29	+5V
A5	SD4	B5	-5V	A30	SA1	B30	OSC
A6	SD3	B6	DRQ2	A31	SA0	B31	GND
A7	SD2	B7	-12V	Connector key		Connector key	
A8	SD1	B8	SRDY_L	C1	SBHE_L	D1	MEMCS16_L
A9	SD0	B9	+12V	C2	LA23	D2	IOCS16_L
A10	IOCHRDY	B10	GND	C3	LA22	D3	IRQ10
A11	AEN	B11	SMEMW_L	C4	LA21	D4	IRQ11
A12	SA19	B12	SMEMR_L	C5	LA20	D5	IRQ12
A13	SA18	B13	IOW_L	C6	LA19	D6	IRQ15
A14	SA17	B14	IOR_L	C7	LA18	D7	IRQ14
A15	SA16	B15	DACK3_L	C8	LA17	D8	DACK0_L
A16	SA15	B16	DRQ3	C9	MEMR_L	D9	DRQ0
A17	SA14	B17	DACK1_L	C10	MEMW_L	D10	DACK5_L
A18	SA13	B18	DRQ1	C11	SD8	D11	DRQ5
A19	SA12	B19	REFRESH_L	C12	SD9	D12	DACK6_L
A20	SA11	B20	BCLK	C13	SD10	D13	DRQ6
A21	SA10	B21	IRQ7	C14	SD11	D14	DACK7_L
A22	SA9	B22	IRQ6	C15	SD12	D15	DRQ7
A23	SA8	B23	IRQ5	C16	SD13	D16	+5V
A24	SA7	B24	IRQ4	C17	SD14	D17	MASTER16_L
A25	SA6	B25	IRQ3	C18	SD15	D18	GND

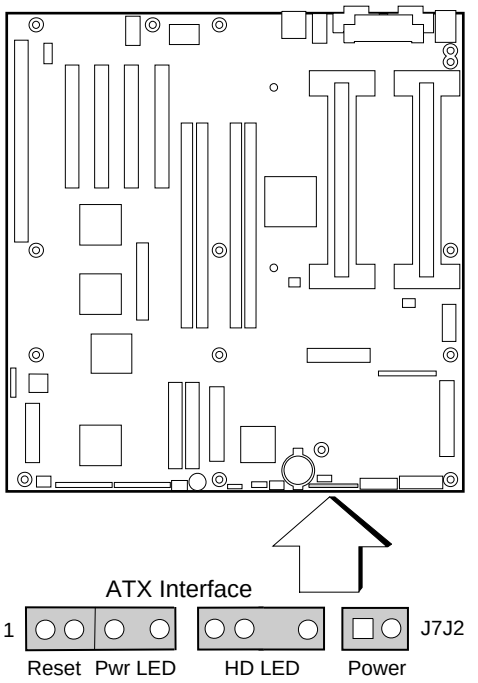
PCI

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	TRST_L	B1	–12 V	A32	AD16	B32	AD17
A2	+12 V	B2	TCK	A33	+3.3 V *	B33	C-BE2_L
A3	TMS	B3	GND	A34	FRAME_L	B34	GND
A4	TDI	B4	TD0	A35	GND	B35	IRDY_L
A5	+5 V	B5	+5 V	A36	TRDY_L	B36	+3.3 V *
A6	INTA_L	B6	+5 V	A37	GND	B37	DEVSEL_L
A7	INTC_L	B7	INTB_L	A38	STOP_L	B38	GND
A8	+5 V	B8	INTD_L	A39	+3.3 V *	B39	LOCK_L
A9	Reserved	B9	PRSNT1_L	A40	SDONE	B40	PERR_L
A10	+5 V	B10	Reserved	A41	SBO_L	B41	+3.3 V *
A11	Reserved	B11	PRSNT2_L	A42	GND	B42	SERR_L
A12	GND	B12	GND	A43	PAR	B43	+3.3 V *
A13	GND	B13	GND	A44	AD15	B44	C-BE1_L
A14	Reserved	B14	Reserved	A45	+3.3 V *	B45	AD14
A15	RST_L	B15	GND	A46	AD13	B46	GND
A16	+5 V	B16	CLK	A47	AD11	B47	AD12
A17	GNT	B17	GND	A48	GND	B48	AD10
A18	GND	B18	REQ_L	A49	AD9	B49	GND
A19	Reserved	B19	+5 V	A50	KEY	B50	KEY
A20	AD30	B20	AD31	A51	KEY	B51	KEY
A21	+3.3 V *	B21	AD29	A52	C-BE0_L	B52	AD8
A22	AD28	B22	GND	A53	+3.3 V *	B53	AD7
A23	AD26	B23	AD27	A54	AD6	B54	+3.3 V *
A24	GND	B24	AD25	A55	AD4	B55	AD5
A25	AD24	B25	+3.3 V *	A56	GND	B56	AD3
A26	IDSEL	B26	C-BE3_L	A57	AD2	B57	GND
A27	+3.3 V *	B27	AD23	A58	AD0	B58	AD1
A28	AD22	B28	GND	A59	+5 V	B59	+5 V
A29	AD20	B29	AD21	A60	REQ64_L	B60	ACK64_L
A30	GND	B30	AD19	A61	+5 V	B61	+5 V
A31	AD18	B31	+3.3 V *	A62	+5 V	B62	+5 V

* The motherboard does not provide a PCI 3.3 V power connector. Only the 5 V PCI signaling environment is supported, and no power is available at the 3.3 V signal pins in expansion slots.

ATX Interface

The motherboard has connectors that meet the standard AT interface for LED indicators and other functions. The connector block is at J7J2.



OM06430a

Connector	Pin	Signal
Front panel reset switch	1	GND
	2	Reset switch
Power LED	3	Current limited +5V
	4	N/C
	5	GND
Hard drive activity LED	7	Current limited +5V
	8	(key)
	9	HD activity LED
	10	Current limited +5V
Front panel power switch	12	Power switch
	13	GND

Declaration of the Manufacturer or Importer

We hereby declare that this product is in compliance with European Union EMC Directive 89/336/EEC, using standards EN55022 (Class B) and EN50082-1 and Low Voltage Directive 73/23/EEC, Standard EN60950.

Safety Compliance

USA: UL 1950, 3rd Edition

Canada: UL certified to CSA C22.2 No. 950-95 for Canada

Europe: TUV to EN60950 2nd Edition, with amendments

International: NEMKO to IEC950 (A1 + A2 + A3 + A4)
NEMKO to EN60950 (A1 + A2),
NEMKO to EMKO-TSE(74-SEC) 207/94

Electromagnetic Compatibility (EMC)

USA: FCC 47 Class B CFR Parts 2 and 15, Tested Class B

Canada: IC ICES-003 Class B

Europe: EN55022, Class B
EN50082-1
IEC 801-2 ESD Susceptibility
IEC 801-3 Radiated Immunity
IEC 801-4 Electrical Fast Transient

International: CISPR 22, Class B

Japan: VCCI Class B ITE

Electromagnetic Compatibility Notice (USA)

This equipment has been tested and verified to Class B limits when in a compatible host computer, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on; the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment. The customer is responsible for ensuring compliance of the modified product.

Only peripherals (computer input / output devices, terminals, printers, etc.) that comply with FCC Class B limits may be attached to this computer product. Operation with noncompliant peripherals is likely to result in interference to radio and TV reception.

All cables used to connect to peripherals must be shielded and grounded. Operation with cables, connected to peripherals, that are not shielded and grounded may result in interference to radio and TV reception.

Class A device definition

If a Class A device is installed within this system, then the system is to be considered a Class A system. In this configuration, operation of this equipment in a residential area is likely to cause harmful interference.

FCC Declaration of Conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions related to the EMC performance of this product, contact:

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124-6497
Phone: 1 (800)-INTEL4U (628-8686)

This equipment has been tested and verified to Class B limits when in a compatible host computer, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio / TV technician for help

International Electromagnetic Compatibility Notices

この装置は、第二種情報装置（住宅地域又はその隣接した地域において使用されるべき情報装置）で住宅地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）基準に適合しております。
しかし、本装置をラジオ、テレビジョン受信機に近接してご使用になると、受信障害の原因となることがあります。
取扱説明書に従って正しい取り扱いをして下さい。

➪ (English translation of the notice above) This equipment is in the Class B category (information equipment to be used in a residential area or an area adjacent thereto) and conforms to the standards set by the Voluntary Control Council For Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential area.
When used near a radio or TV receiver, it may become the cause of radio interference.
Read the instructions for correct handling.

➪ This equipment has been tested for radio frequency emissions and has been verified to meet CISPR 22 Class B.

➪ Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouilleur: “Appareils Numériques”, NMB-003 édictée par le Ministre Canadian des Communications.

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled “Digital Apparatus”, ICES-003 of the Canadian Department of Communications.

□ □ □

Information for Computer Integrators 7

This chapter describes:

- Safety Standards, Electromagnetic Compatibility Regulations, and Product Certification Markings for the R440LX motherboard
- Instructions and precautions for integrators who are installing this motherboard in a host computer

Regulatory Requirements

This motherboard complies with the following safety and electromagnetic compatibility (EMC) regulations when correctly installed in a compatible host computer.

Safety Standards

UL 1950 - CSA 950-95, 3rd Edition, July 28, 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)

CSA C22.2 No. 950-95, 3rd Edition, July 28, 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (Canada)

EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)

IEC 950, 2nd edition, 1991 (with Amendments 1, 2, 3 and 4)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)

EMKO-TSE (74-SEC) 207/94

Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark, and Finland)

EMC Regulations

FCC Class B

Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)

CISPR 22, 2nd Edition, 1993, Amendment 1, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)

EN 55 022, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)

EN 50 082-1, 1992

Generic Immunity Standard. Currently, compliance is determined via testing to IEC 801-2, -3 and -4. (Europe)

VCCI Class B (ITE)

Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)

ICES-003, Issue 2

Interference-Causing Equipment Standard, Digital Apparatus. (Canada)

Spectrum Management Agency (SMA) — Australian C-Tick Compliance

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Australian Regulation based on International CISPR 22 Requirements)

New Zealand Ministry of Commerce

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (New Zealand Regulation based on International CISPR 22 Requirements - New Zealand Authorities accept SMA C-Tick Compliance Mark)

Product Certification Markings

This motherboard has the following product certification markings:

- European CE Mark

  — Marking on the board assembly and / or shipping container.

- UL Recognition Mark

  — Marking is a stylized backward UR and UL File No. E139761 on the component side of the board and the PB No. on the solder side of the board. Board material flammability is 94V-1 or -0.

- Canadian Compliance Mark

  — Marking is a small c followed by a stylized backward UR on the component side of the board.

- Australian SMA C-Tick Compliance Mark

  — Marking is a solid circle with a white tick-like mark within the circle, accompanied by the four-digit supplier code.

Installation Instructions

⚠ CAUTION

Follow these guidelines to meet safety and regulatory requirements when installing this board assembly.

Read and adhere to all of these instructions and the instructions supplied with the host computer and associated modules. If the instructions for the host computer are inconsistent with these instructions or the instructions for associated modules, contact the supplier's technical support to find out how you can ensure that your computer meets safety and regulatory requirements. If you do not follow these instructions and the instructions provided by host computer and module suppliers, you increase safety risk and the possibility of non-compliance with regional laws and regulations.

Ensure EMC

Before computer integration, make sure that the host chassis, power supply, and other modules have passed EMC certification testing.

In the installation instructions for the host chassis, power supply, and other modules pay close attention to the following:

- Certifications (see "Ensure Host Computer and Accessory Module Certfications" on page 153.)
- External I/O cable shielding and filtering
- Mounting, grounding, and bonding requirements
- Keying connectors when mismating of connectors could be hazardous

If the host chassis, power supply, and other modules have not passed applicable EMC certification testing before integration, EMC testing must be conducted on a representative sample of the newly completed computer.

Ensure Host Computer and Accessory Module Certfications

Make sure that the host computer, any added subassembly (such as a board or drive assembly, including internal or external wiring), are certified for the region(s) where the end-product will be used. Marks on the product are proof of certification. Certification marks are as follows:

In Europe

The CE marking signifies compliance with all relevant European requirements. If the host computer does not bear the CE marking, obtain a supplier's Declaration of Conformity to the appropriate standards required by the European EMC Directive and Low Voltage Directive. Other directives, such as the Machinery and Telecommunications Directives, may also apply depending on the type of product. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. This Intel motherboard has PTCs on all external ports that provide DC power externally.

In the United States

A certification mark by a Nationally Recognized Testing Laboratory (NRTL) such as UL, CSA, or ETL signifies compliance with safety requirements. External wiring must be UL Listed and suitable for the intended use. Internal wiring must be UL Listed or Recognized and rated for applicable voltages and temperatures. The FCC mark (Class A for commercial or industrial only or Class B for residential) signifies compliance with electromagnetic interference requirements.

In Canada

A nationally recognized certification mark such as CSA or cUL signifies compliance with safety requirements. No regulatory assessment is necessary for low-voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum approved 5-Amp fuse or positive temperature coefficient (PTC) resistor. This motherboard has PTCs on all external ports that provide DC power externally.

Prevent Power Supply Overload

Do not overload the power supply output. To avoid overloading the power supply, make sure that the calculated total current load of all the modules within the computer is less than the maximum output current rating of the power supply. If you do not do this, the power supply may overheat, catch fire, or damage the insulation that separates hazardous AC line circuitry from low-voltage user accessible circuitry and result in a shock hazard. If the load drawn by a module cannot be determined by the markings and instructions supplied with the module, contact the module supplier's technical support.

Place Battery Marking on Computer

There is insufficient space on this motherboard to provide instructions for replacing and disposing of the battery. The following warning must be placed permanently and legibly on the host computer as near as possible to the battery.

WARNING
Danger of explosion if battery is incorrectly replaced.

Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Use Only for Intended Applications

This product was evaluated for use in ITE computers that will be installed in offices, schools, computer rooms and similar locations. The suitability of this product for other product categories other than ITE applications, (such as medical, industrial, alarm systems, and test equipment) may require further evaluation.

Installation Precautions

When you install and test the motherboard, observe all warnings and cautions in the installation instructions.

To avoid injury, be careful of:

- Sharp pins on connectors
- Sharp pins on printed circuit assemblies
- Rough edges and sharp corners on the chassis
- Hot components (like processors, voltage regulators, and heat sinks)
- Damage to wires that could cause a short circuit

Observe all warnings and cautions that instruct you to refer computer servicing to qualified technical personnel.

WARNING
Do not open the power supply. Risk of electric shock and burns from high voltage and rapid overheating. Refer servicing of the power supply to qualified technical personnel.

❑ ❑ ❑

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